Metals Review

THE NEWS DIGEST MAGAZINE

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A.S.M. REVIEW OF METAL LITERATURE

SPECIAL FEATURES

IMPORTANT LECTURES

DEPARTMENTS

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Nodular Graphite in Cast Iron

Survey of a Major Metallurgical Development Destined for Important Engineering and Industrial Uses

By H. W. Lownie, Jr. *Assistant Supervisor, Battelle Memorial Institute*

IT HAS BEEN recognized for many years that the graphite flakes which are the chief structural characteristic of gray cast iron are largely responsible for the excellent machinability, high damping capacity, good wear resistance, and excellent foundry properties of gray iron. On the other hand, the graphite flakes are also partially responsible for the poor toughness and the limited tenile strength of gray iron. Recognizing the disadvantages of flake graphite, metallurgists have for a long time considered the possibility of developing the graphitic carbon in as-cast gray iron in the form of nodules or spheres instead of in flakes.

When the graphitic carbon is in the form of nodules, irons have higher strength and better toughness because nodules interrupt the continuity of the matrix much less than the same amount of carbon in flake form.

British Developments

During the past 20 years, occasional reports in the literature have indicated that nodular graphite structures were sometimes observed in as-cast gray irons. These nodular structures usually appeared in high-carbon hypereutectic irons that were rapidly cooled, but little attention was given the development of these structures and no process was perfected for producing the nodular graphite at will in as-cast irons.

About 1940, the British Cast Iron Research Association undertook an intensive program on the development of nodular graphite in cast iron. The work was well planned and well directed, and in early 1947, Morrogh and Williams of this association published a paper on graphite formation in cast iron and in nickel-carbon and cobalt-carbon alloys (4-59, 1947).* This paper was a complete review of most of the fundamental work that had been done on the formation of graphitic carbon in cast irons and included an excellent discussion of the existing theories of graphitization and the anomalies that had been observed. The authors pointed out analogies between the nickel-carbon and cobalt-carbon systems and the cast-iron system, and showed that nodular graphite could be produced at will in the former systems by treatment with calcium or magnesium. Little information was given on the development of nodular graphite in cast irons, but several examples were shown to illustrate that such structures could be obtained under special conditions.

In February 1948 (4b-27, May 1948), Morrogh revealed that nodular graphite could be obtained in cast irons by treatment in the ladle with cerium. This was the first public disclosure of a process for reproducibly obtaining nodular graphite in the as-cast state in cast irons. Shortly thereafter, Morrogh presented a paper on nodular graphite structures produced in gray cast iron before the annual meeting of the American Foundrymen's Society (4b-31, June 1948). This was the first publication of such a process in this country and is generally regarded as a major contribution to the field of metallurgy and the product of carefully considered and well-conducted research.

American Developments

Immediately following the presentation of Morrogh's paper in May, the International Nickel Co. announced that it had developed a process utilizing magnesium as an addition to produce nodular irons. This announcement has now been amplified (see page 62 of this issue), and the properties of the irons produced by treatment with magnesium have been reported in two recent publications by the American Cast Iron Pipe Co. and by the International Nickel Co.

Although less than one year has elapsed since the first public disclosures of the cerium and magnesium treatments for cast iron, a number of people have given considerable study to the making of nodular cast iron and the advantages and disadvantages of the two processes are beginning to be clarified. British work has been primarily directed toward treatment with cerium and American work toward treatment with magnesium.

Cerium Treatment

The history of the cerium-treatment process is contained in nine publications based upon the BCIRA work in England and abstracted in *Iron Age* last November (3b-193, Jan. 1949.* The cerium is added to molten cast iron of appropriate composition shortly before casting. Requirements of the iron for successful treatment are:

1. The iron must solidify gray even without the cerium addition.
2. The iron must be hypereutectic. That is, the total of the carbon content plus 1/3 the silicon and 1/3 the phosphorus contents must exceed 4.3%.
3. The silicon content may be any value but is preferred in the range from 2.3 to 2.7%.
4. The sulphur content of the iron should be as low as possible and should not exceed 0.02% after treatment.
5. The phosphorus content should be below 0.6%, and perferably below 0.1%.
6. Manganese, copper, nickel, chromium, and molybdenum may be present in any amounts, provided the iron solidifies gray.
7. After treatment, the solidified castings should contain more than 0.02% cerium.

The carbon content of the iron and its sulphur content appear to be the two main factors which control successful treatment with cerium. Because cerium is a powerful desulphurizer, it combines with sulphur and forms a cerium-sulphur compound that is relatively insoluble and can be skimmed from the ladle. The cerium apparently will not become effective in producing nodular iron until the sulphur content of the iron

*Literature references are cited by the corresponding item number in the Review of Current Metal Literature instead of repeating the entire title, author, and source; this information can be obtained by referring to *Metals Review* for the month indicated, or the 1947 bound volume of the A.S.M. Review of Metal Literature (Volume 4).

*References to these nine publications in the Review of Metal Literature are as follows: 4-59, 4-127, 4-149, 1947; 3b-7, Feb. 1948; 3b-32, April 1948; 4b-27, May 1948; 4b-31, 14b-65, 14b-68, June 1948; 3b-87, Aug. 1948; 3b-124, 4b-54, Sept. 1948; 3b-128, Oct. 1948; 4b-120, 1948.

is reduced to about 0.02%. The important role of sulphur in limiting the effectiveness of cerium additions seriously hampers economical application of the process to commercial cupola irons unless effective desulphurization can be carried out prior to treatment with cerium.

Cerium is added to cast iron in the form of misch metal containing about 50% cerium and 50% other rare earths, and appears to go into solution readily and quietly. Additions of cerium are usually in the range of 0.20 to 0.35% of the weight of the iron, and residual cerium contents of about 0.02 to 0.06% in the metal appear to give the desired nodular structure. The cerium addition must be made in the ladle because the cerium is lost by remelting or by excessive holding at high temperature. Best results are obtained by the so-called "double treatment" in which the cerium-treated iron is inoculated in the ladle with a silicon-bearing inoculant.

Nodular-graphite irons can be produced with better as-cast transverse and tensile strengths than the best present high-strength alloy irons, with flake-graphite structure. These high strengths can be obtained at relatively low hardness and with two to four time the shock resistance of irons containing flake graphite.

The as-cast tensile strengths of cerium-treated irons range from about 64,000 to 86,000 psi. with modulus of elasticity up to 24,600,000 psi. Elongation at fracture is greater than for flake-graphite irons but less than for malleable cast irons.

Morrogh and Grant (3b-182, Dec. 1948; (3b-194, Jan. 1949) reported that, in tensile and transverse loading, the nodular irons show less strain than flake-graphite irons at low stress, but show considerably greater strain at higher stresses. Nodular irons show no well-defined yield point. The moduli of elasticity are high because of the low elastic deformation of these irons. High elongations in the tensile test and high deflections in the transverse test are obtained because of high plastic deformation at high stresses.

The Brinell hardness of cerium-treated nodular irons tends to be slightly higher than that of untreated iron of the same base composition, but considerably lower than flake-graphite irons of the same tensile strength.

In the British impact test on cylindrical machined test pieces 0.798 in. in diameter, the average impact strength of a pearlitic flake-graphite iron is about 20 ft-lb. and that of a high-duty, flake-graphite acicular-matrix iron is about 30 to 40 ft-lb. Most of the nodular irons reported by Morrogh and Grant showed impact strengths of at least 50 ft-lb. in this test and some of the double-treated irons withstood the full 120-ft-lb. load of the testing machine without failure. Although the shock resistance of these cerium-treated nodular cast irons was materially better than flake-graphite irons, the nodular irons are still relatively brittle when compared to malleable iron or steel.

High damping capacity has often been cited as a desirable characteristic of flake-graphite cast irons, and some of this damping capacity is sacrificed in the nodular structure. Typical values of specific damping capacity in torsion at a surface shear stress of about 22,000 psi. are:

Flake-graphite iron	25%
Nodular-graphite iron	
Single-treated	11%
Double-treated	6%
Mild steel	2%

In dynamic fatigue strength tests, endurance ratios of about 0.46 to 0.59% were obtained on unnotched bars as compared to ratios of about 0.34 to 0.45% for flake-graphite pearlitic and acicular irons. In notched bars, the nodular structures were more notch sensitive than the flake-graphite irons.

A number of tests were also reported by Morrogh and Grant on the annealing and heat treatment of unalloyed and alloyed nodular irons. Properties were appreciably improved when the matrix was altered by heat treatment. The nodular structure persisted essentially unchanged through most of the heat treatments employed. Unalloyed irons were annealed 2 hr. at 1290° F. to produce irons with up to 8% elongation, 66,000 psi. tensile strength, and Brinell hardness of 130 to 180. Quenched and tempered nodular irons showed tensile strengths on the order of 115,000 psi. with a Brinell hardness of about 335.

Phosphorus has a generally deleterious effect upon the properties of nodular irons produced by the cerium treatment. In addition to a directly harmful effect upon properties, it appears to reduce the solubility of cerium in the cast iron. In one iron with a base composition of 3.78% total carbon, 2.67% silicon, and 0.018% sulphur, when the phosphorus was increased from 0.024 to 0.29%, the impact strength was reduced from 35 to 17 ft-lb. although the dissolved cerium was reduced only from 0.040 to 0.035%. When the phosphorus was increased to 0.57%, the impact strength decreased from 35 to 8 ft-lb., the tensile strength decreased from 50,000 to 25,000 psi., and flake graphite was formed.

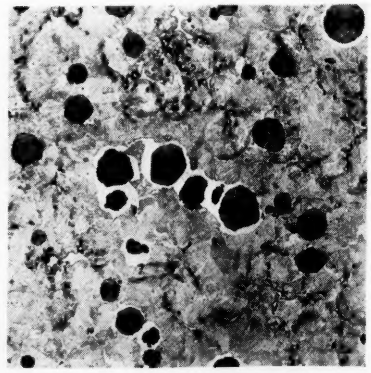
Magnesium Treatment

It has been verified in this country by a number of investigators that the cerium treatment will effectively produce nodular graphite when the conditions outlined by the British Cast Iron Research Association are observed. However, the necessity of using high-carbon hypereutectic base irons reduces the flexibility of the process and results in a relatively high amount of graphitic carbon in the treated iron. The reduction of sulphur in the iron to 0.02% before cerium becomes effective is also a decided problem when it is realized that the majority of cast iron is melted in a cupola and contains about 0.09 to 0.14% sulphur. A reduction in sulphur to 0.02% by conventional alkali treatment, although simple in theory, is relatively difficult in practice. Desulphurization by addition of excess cerium is commercially uneconomical. Therefore, primary interest in this country has shifted to magnesium treatment, and experiments along this line are being made in various quarters.

The photomicrographs below compare the structures of a cupola-melted hypereutectic iron, before and after treatment in the ladle with a nickel-magnesium alloy. The closely-knit spherical form of the graphite nodules is typical of the structure generally obtained with either cerium or magnesium.

An inclusive investigation on the magnesium treatment is reported by Donoho of the American Cast Iron Pipe Co. (14B-16, this issue).

Microstructures of Cupola-Melted Hypereutectic Cast Iron. Left, before treatment, and right, after treatment with magnesium to produce nodular graphite. Tensile strength in 1.2-in. diameter bars was 18,400 psi. before, and 55,500 psi. after treatment. (Gray Iron Research Institute)



Treatment was not limited to hypereutectic irons; the desired structure was obtained in irons with carbon contents as low as 2.50%.

Magnesium, like cerium, is a desulphurizer, so the sulphur must be brought to a fairly low level before the magnesium becomes effective in producing nodular graphite. By adding an excess of magnesium to cupola irons containing about 0.09% sulphur, the iron was desulphurized to about 0.04% and sufficient magnesium was retained to form nodular graphite. Donoho suggests that, if the magnesium can be added in an economical form, such treatment for desulphurizing may be more convenient and practical than alkali treatment.

In these tests, magnesium was added in a variety of forms. With over 50% magnesium in the addition alloy, the reaction with the molten iron was quite violent, required considerable care, and produced recoveries on the order of 5 to 10% of the magnesium added. Recoveries improved and the activity of the reaction decreased as the amount of magnesium in the addition alloy was reduced. It was found that the nodular structure could be obtained with copper-magnesium, and nickel-magnesium alloys, with pig magnesium, magnesium aircraft scrap, and with magnesium alloys of lithium, silicon, aluminum, iron, and bismuth.

The desired structure was not obtained when magnesium was combined with zirconium, titanium, calcium, or manganese. The alloys of copper or nickel containing 20% magnesium were the most effective and convenient addition agents. These dilute alloys (especially the copper-magnesium) are not dangerous to handle if the alloy is added on top of the iron and allowed to burn, but the economics of using copper or nickel merely as diluents appear to warrant further investigation.

In the amounts required to produce nodular graphite, magnesium acts as a carbide stabilizer. Therefore, it has been found desirable to follow the magnesium treatment with inoculation by a silicon-base alloy to help develop a uniform distribution of nodules and prevent mottling.

The amount of magnesium retained in the iron is critical if the best properties are to be obtained. Insufficient magnesium does not completely develop the desired structure and an excess of magnesium produces free carbides. On one type of iron optimum properties were obtained with 0.05 to 0.07% magnesium. To retain this content, it was necessary to add about 0.35 to 0.60% magnesium in the form of 50% magnesium-copper or magnesium-nickel alloy.

In the magnesium treatment, phosphorus content is apparently less critical than in the cerium process, and Donoho reported little difficulty in producing nodular irons with up to 0.70% phosphorus. However, phosphorus above 0.15% is still considered harmful because it increases shrinkage and lowers ductility. Tests on round bars from 0.6 to 3 in. in diameter, cast from magnesium-treated irons, showed that the strength and hardness decrease gradually with increasing section size, but that generally the nodular irons are less sensitive to section size than the flake-graphite iron.

Of particular interest in Donoho's work were the results obtained on magnesium-treated nodular irons cast into keel-block specimens. The superiority of the mechanical properties in the as-cast condition over those of conventional flake-graphite irons of similar composition is little short of phenomenal. After a 1-hr. anneal at 1650°F., the properties approach those of cast steel and are superior to those usually reported for malleable irons.

Magnesium-treated nodular iron castings have been made experimentally by American Cast Iron Pipe Co. in the form of pipes up to 16 ft. in diameter and fittings weighing up to 2500 lb. Strengths were generally two to three times those obtained with conventional flake-graphite irons, and the impact and toughness values were even more impressive.

Use of Nickel-Magnesium Alloy

Also very recently (3B-24, this issue), Gagnebin, Millis and Pilling published a report on the properties of "ductile cast iron" as produced by the International Nickel Co. The mechanical properties agree closely with those reported by Donoho, and similar improvements in toughness and ductility were obtained after 1-hr. annealing or normalizing treatments. Little information is given on the method of treatment to produce the nodular graphite structure, except to state that a nickel-magnesium alloy was used.

After treatment, the irons generally contained about 0.05 to 0.07% magnesium and about 2% nickel. According to these authors, a useful composition of base iron for ductile cast iron contains 3.2 to 3.6% carbon, 1.8 to 2.5% silicon, 0.3% maximum manganese, and 0.05% maximum phosphorus. The desirable sulphur content is not given, but it is stated that the process can be applied to irons melted in the cupola or in any other melting unit.

The treated irons have modulus of elasticity from 24.6 to 26.5 million psi. Section sensitivity is less than for conventional cast irons. Cupola-melted magnesium - treated irons which had a tensile strength of 85,000 to 90,000 psi. in 1-in. sections developed 70,000 to 80,000 psi. in 6-in. sections.

Magnesium-treated irons with the graphite in the spheroidal form showed less growth and less oxide penetration at 1600° F. than a chromium-nickel heat resisting cast iron containing flake graphite. Castability was reported as excellent, although feeding requirements were greater than for flake-graphite irons of similar base composition. It is suggested that the gating and risering should follow the practice for low-carbon, high-strength irons.

In arc welding with nickel electrodes, flake graphite was not regenerated in the weld zone. The magnesium - treated irons containing spheroidal graphite machine as freely as conventional cast iron of similar hardness, and considerably better than conventional irons of similar strength. The machined surface of the nodular iron tends to be smoother than that of conventional flake-graphite irons.

Patent Status and Resources

The British Cast Iron Research Association has filed for patents, as have several companies in this country. The nature and extent of the claims covered in the various applications is not known, and, although the patent situation is not clear at this time, a number of foundries and associations are conducting considerable experimental work that is aimed toward commercial production.

Cerium is available in this country in quantity in the form of misch metal containing about 50% cerium. At the present price of about $4.50 per lb., the cost of the misch metal for treating cast iron with 0.15% cerium would be about $27 per ton.

Magnesium aircraft scrap, which is known to be satisfactory for producing the nodular structure, is readily available at low cost. Such concentrated forms of magnesium, however, are violently reactive in the molten iron and are dangerous to handle. If high-magnesium additions are to be used, a new and improved method will have to be developed for their addition. Pig magnesium is quoted at about 21 cents per lb. Alloys of 50 or 30% magnesium with copper or nickel are being produced by the Dow Chemical Co., in limited quantities at about 75 cents per lb. for the copper alloys and $1 per lb. for the nickel. If production is increased because of demand, it is estimated that the copper-magnesium alloys may be available for about 40 cents. The cost of an addition of about 0.60% magnesium to develop the nodular structure would then be about $10 per ton. This cost might be reduced considerably if methods of improving the recovery of more concentrated forms of magnesium are developed.

Mechanism of Nodular Graphite Formation

Theories of graphitization have never satisfactorily explained all of the phenomena involved in the formation of graphite flakes in gray cast iron. With the discovery of the nodular structure, considerable modi-

fication and extension of existing theories may be required. Present information indicates that nodular irons actually solidify white and that the iron carbide almost immediately decomposes to form nodular graphite. The role of cerium and magnesium is apparently to stabilize the iron carbide to a temperature below that at which flake graphite forms, so that upon decomposition the nodular structure is produced.

Albert de Sy (4B-8, March 1949) proposes that solid suspended particles in the melt tend to nucleate the crystallization of phases of the same crystal structure as the particles. Therefore, since flake graphite is of hexagonal crystal structure, it is nucleated by hexagonal SiO_2 particles in the melt. By adding to the melt deoxidizers which are more powerful than silicon, the formation of SiO_2 is retarded. Cerium and magnesium are such deoxidizers and their oxides have a cubic crystal structure which, according to this theory, will nucleate austenite in preference to graphite, thus suppressing early formation of graphite.

Mr. de Sy has recently extended his work to a study of lithium which, according to the theory, should—and does—behave similarly to cerium and magnesium. The presence of a nucleating influence of some type can hardly be denied. An interesting observation is that examination of well-prepared photomicrographs of a number of graphite nodules shown in the literature reveals a surprising number of nodules with a light-colored "core" which may be nonmetallic.

Problems for the Future

It has been thoroughly demonstrated that cast irons can be produced with graphite in nodular form before heat treatment and that these irons exhibit unusual properties. However, there are still a number of problems to be solved before the process can be considered ready for general commercial adoption. The relative advantages and disadvantages of the cerium and magnesium treatments must be clarified. The method of adding the stabilizing alloy and the nature of the alloy present a broad field for further study. The important effect of suphur upon the efficiency of the nodularizing elements suggests that better methods are needed for desulphurizing rapidly and conveniently. The possible use of basic-lined cupolas has been suggested.

Foundry characteristics (fluidity and shrinkage) apparently are not so good in the nodular-graphite irons as in the conventional flake-graphite irons. The remarkable improvement in properties of nodular-graphite irons by short annealing treatments suggests that even better properties may be developed by further heat treatment. Also, little work has yet been done in combining the nodular form of graphite with high-strength matrices such as tempered martensite or acicular structures provide.

Regardless of the course that future investigations take, it is certain that a new engineering material of unique properties is being developed. Because of the simplicity of the process, it bids fair to put up a stiff fight against other casting materials. Industry in general can be expected to feel the influence of the new material more and more as the results of additional investigations are published.

Buffalo Honors President

Reported by G. F. Kappelt

Chief Metallurgist, Bell Aircraft Corp.

Buffalo Chapter A.S.M. was host to H. K. Work, national president, at its January dinner meeting. Despite the fact that Secretary Bill Eisenman is on the West Coast taking care of the affairs of the Western Metal Congress, the chapter did hear both ends of the "alligator" story from Dr. Work before his formal talk on "Some Factors Affecting the Behavior of Steel During Cold Work".

The coffee speaking honors were taken over by Harry G. Maynor, special agent in charge of the Buffalo regional office of the F.B.I.

Past chairmen of the Chapter were honored along with the national president. This group consisted of approximately 20 men, dating back to the oldest living past chairman, G. J. Armstrong, who held office in 1925.

The Reviewing Stand

AT THE RISK of "breaking" a story long before the time is ripe, we herewith stick our necks out and let the readers in on a *Metals Review* publication project that probably won't materialize for quite a few months to come. The reason is that, as usual, we need help.

The A.S.M. Review of Metal Literature doubtless performs an invaluable function in keeping metallurgists informed of the literature that is being published throughout the world, and giving them that information with the utmost dispatch. But why stop there? It isn't going to do the poor guy much good if he doesn't know where or how to go about getting the original publication—or a reasonable facsimile thereof.

Hence a great need seems to exist for a guide to convenient sources of original publications, and such a guide is envisioned as a series of articles in future issues of *Metals Review*. Among the subjects planned for these articles are photostating and microfilming services, their sources and cost; government publications—what bureaus and agencies issue material of interest to metallurgists and how it can be procured; translations and translating agencies—to mention just a few.

But of first importance in the series would be a good geographical directory of metallurgical libraries with an indication of the extent of their collections and the type of services they are able to render. The librarians so far approached on this matter have been most cooperative and contributed some valuable suggestions, yet nowhere, apparently, is an up-to-date and complete list of metallurgical libraries available.

Help has also been solicited from the various chapter reporters who contribute to *Metals Review*, and they have responded handsomely with enough material and suggestions for an excellent beginning. But doubtless there are other A.S.M. members who are in close touch with library and information services, and could put us on the trail of sources that might otherwise be overlooked.

The list will include three categories—public and independent libraries, those connected with schools and colleges, and industrial libraries maintained by manufacturing firms (the latter being by far the largest group and most difficult to compile).

All that is needed at the present time is the list. Once that is in hand and complete, it will be a relatively simple matter to get the desired information from the individual librarians. So any altruist who wants to contribute his bit to the wider usefulness of metallurgical literature is cordially invited to drop a note to *Metals Review*. Just jot down the names of local or regional libraries that are likely to have even a small store of metallurgical books and periodicals.

M. R. H.

Western Metal Congress

Los Angeles, April 11-15, 1949

Programs Scheduled by Five Cooperating Technical Societies

MORE THAN 100 papers on ferrous and nonferrous products will be delivered at the Western Metal Congress and Exposition, April 11 through 15 in Los Angeles. The exposition and most of the technical sessions will be held in Shrine Convention Hall. Only the morning sessions of April 11, 12 and 13 will be presented in the Biltmore Hotel.

With approximately 200 nationally known firms exhibiting, the exposition will include displays of new and improved metals, welding and heat treating equipment, foundry supplies, inspection and testing devices and methods, machining equipment, metal cutting and tools. The list of exhibitors up to press date is given on page 11.

Five national technical societies will offer programs. These are the American Society for Metals (ASM), American Welding Society (AWS), American Foundrymen's Society (AFS), American Institute of Mining and Metallurgical Engineers (AIME), and Society for Non-Destructive Testing (SNDT). Approximately 15 other societies will cooperate otherwise.

In addition to the regular daily technical sessions, three special educational programs have been arranged by the American Society for Metals. One of these, on the subject of "Corrosion", is scheduled for Tuesday morning, April 12; a second is on "Metals for Use at High Temperatures" on Wednesday morning and afternoon; while the third, on the subject of "Metallography", will consist of four lectures on Monday, Tuesday and Wednesday evenings, and Friday afternoon at 4:00 p.m.

The day-by-day program of the various cooperating societies is shown below.

Monday, April 11, Morning

ASM Technical Session

Precision Investment Casting, by A. W. Merrick, Austenal Laboratories, New York.

Hardness Testing, by V. E. Lysaght, Wilson Mechanical Instrument Co., New York.

The Surface Diffusion of Radioactive Silver on Silver, by R. A. Nickerson and Earl R. Parker, University of California, Berkeley.

AWS—Automatic Welding

Tandem-Arc Submerged-Melt Welding of Line Pipe, by Charles A. Babbitt, Cal-Metal Corp., Torrance, Calif.

Automatic Welding of Pressure Vessels, by Clinton E. Swift, C. F. Braun & Co., Alhambra, Calif.

Developments in Automatic Hard Facing, by H. W. Sharp, Stoody Co., Whittier, Calif.

April 11, Afternoon

ASM Technical Session

A New Theory for the Solid State, by Carl A. Zapffe, consulting metallurgist, Baltimore.

The Sigma Phase, by Francis B. Foley, Midvale Co., Philadelphia.

Mechanical Properties and Efficient Designing With Magnesium, by George H. Found, Dow Chemical Co., Midland, Mich.

AWS—Welding Research

Welded Ship Failures and Their Relation to Other Structures, by E. Paul DeGarmo, University of California, Berkeley.

Brittle Fracture of Mild Steels and Heat Treated Alloy Steels, by Earl R. Parker, University of California.

Recent Researches on the Metallurgy of Welding, by Alan E. Flanigan, University of California.

*AIME Technical Session (To Be Announced)**

Hours and Places of Main Events

Exposition

Mon., Tues., Wed., April 11, 12, 13—12 noon to 10:30 p.m.

Thurs., Fri., April 14, 15—10 a.m. to 6 p.m.

Place—Shrine Convention Hall

Technical Sessions

Daily—9:30 a.m., 2 p.m., 8 p.m.

Fri., April 15—4 p.m. (no evening session)

Place — Shrine Convention Hall, except morning sessions, April 11, 12, 13, at Biltmore Hotel

Dinner-Dance

Thurs., April 14, 8 p.m.—Biltmore Bowl

April 11, Evening

ASM—Metallography

Metallography of Aluminum Alloys, by Ray Bossert, Aluminum Co. of America, Vernon, Calif.

AWS—Welding Metallurgy

Panel Discussion, by C. B. Voldrich, Battelle Memorial Institute, Columbus, Ohio; E. R. Parker, University of California, Berkeley; Alex Maradudin, Standard Oil Co. of California, El Segundo; Alan E. Flanigan, University of California; Donald S. Clark, California Institute of Technology.

*See footnote on page 10.

Tuesday, April 12, Morning

ASM—Corrosion

Fundamental Theories of Corrosion, by Richard Pomeroy, Montgomery and Pomeroy, Pasadena, Calif.

Corrosion Problems in Light Alloys, by Roy E. Paine, Aluminum Co. of America, Los Angeles.

Corrosion Protection of Refinery Equipment, by Henry P. Zeh, Standard Oil Co. of California, San Francisco.

AWS—Electrodes, Cutting and Brazing

Electrodes, Their Coatings and Influences, by John J. Chyle, A. O. Smith Corp., Milwaukee.

Arc-Air Cutting and Gouging, by Myron D. Stepath, Puget Sound Naval Shipyard, Bremerton, Wash.

Strength of Silver-Brazed Joints, by A. M. Setaphen, Handy and Harman, New York.

April 12, Afternoon

ASM Technical Session

Metallurgical Problems in Drilling and Petroleum Production, by Morton Spar and G. W. Whitney, Emsco Derrick & Equipment Co., Los Angeles.

Fractographic Structures in Weld Metal, by Carl A. Zapffe and C. O. Worden, consulting metallurgists, Baltimore, Md.

Some Factors Affecting Behavior of Steel During Cold Working, by Harold K. Work, New York University, College of Engineering.

*AIME Technical Session (To Be Announced)**

SNDT—Automotive Industry and Railroad Session

April 12, Evening

ASM—Metallography

Metallography of Copper Alloys, by Harry P. Croft, Wheeling Bronze Casting Co., Moundsville, West, Va.

AWS—Welding Design Clinic

Panel Discussion, by E. Paul DeGarmo, University of California, Berkeley; M. H. MacKusick, consulting engineer, Los Angeles; F. J. Pilia, Linde Air Products Co., Newark, N. J.; R. T. Gillette, General Electric Co., Schenectady, N. Y.

SNDT—Aircraft Industry and Manufacturing Control

Wednesday, April 13 Morning

ASM—High-Temperature Metals

Chromium-Iron and Chromium-Nickel-Iron Alloys for High-Temperature Service in Petroleum Refineries, by E. E. Thum, editor, *Metal Progress*, Cleveland.

General Review of Development of High-Temperature Alloys for Jet Engines, by Roger Long, National Advisory Committee for Aeronautics, Cleveland.

Refractory Metals, Such as Molybdenum, Zirconium, Tungsten, Tantalum, for Ultra-High Temperature Service, by Earl R. Parker, University of California, Berkeley.

AWS—Inert-Gas-Shielded Arc Welding

The Application of Inert-Gas Arc Welding to Airframes and Engines, by Tom E. Piper, Northrop Aircraft, Hawthorne, Calif.

Welding With the Aircomatic Process, by E. H. Roper, Air Reduction Sales Co., New York.

Heliarc Welding in Production, by F. J. Pilia, Linde Air Products Co., Newark, N. J.

April 13, Afternoon

ASM—High-Temperature Metals

Formability of Various Alloys for High-Temperature Service Applications, by J. F. Tyrrell, Solar Aircraft Co., San Diego.

A Cobalt-Base Sheet Alloy for High-Temperature Service, by W. O. Binder and H. R. Spendelow, Jr., Union Carbide and Carbon Research Laboratories, Niagara Falls, N. Y.

Metallurgical Considerations in the Application of Nuclear Energy for the Propulsion of Aircraft, by Walter J. Koshuba, NEPA Project, Oak Ridge, Tenn.

AWS—Nonferrous Welding

New Developments in the Welding of Aluminum, by C. B. Voldrich, Battelle Memorial Institute, Columbus, Ohio.

Welding of High-Nickel Alloys, by Kenneth M. Spicer, International Nickel Co., New York.

Resistance Welding of Nickel Alloys, by Frank G. Harkins, Solar Aircraft Co., San Diego.

SNDT—Oil Tool Manufacturing and Oil Tool Service

April 13, Evening

ASM—Metallography

Metallography of Carbon and Low-Alloy Steels, by Wilbur R. Varney, California Institute of Technology, Pasadena.

AWS—Aircraft Welding

Panel Discussion, by Tom E. Piper, Northrop Aircraft, Hawthorne, Calif.; Frank G. Harkins, Solar Aircraft Co., San Diego; Charles E. Smith, Douglas Aircraft Co., Long Beach; Fred Pipher, Lockheed Aircraft Co., Burbank; Bert Gross, Rohr Aircraft, Chula Vista, Calif.

AFS Technical Session (To Be Announced)†

Thursday, April 14 Morning

ASM Technical Session

Metals for Use at Low Temperatures, by S. L. Hoyt, Battelle Memorial Institute, Columbus, Ohio.

The Fabrication of Stainless Steels, by Bernard Gross, Rohr Aircraft Corp., Chula Vista, Calif.

Recent Developments in Strain Measurement, by William T. Bean, Jr., consultant, Detroit.

AWS—Resistance Welding

Resistance Welding—History, Design, Control and Application. by Robert T. Gillette, General Electric Co., Schenectady, N. Y.

Some Developments in Resistance Welding Controls, by Eugene Lica, Douglas Aircraft Co., Santa Monica, Calif.

Three-Phase Resistance Welding Machinery, by J. H. Cooper, Taylor-Winfield Corp., Warren, Ohio.

*AIME Technical Session (To Be Announced)**

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*Papers for four A.I.M.E. sessions include the following:

The Nature and Control of Emissions From the Stack of the Common Cupola, by John F. Drake, Kennard & Drake, Arcadia, Calif.

A Mathematical Approach to the Prediction of the Mechanical and Chemical Properties of Metal Alloys, by Pol Duwez, California Institute of Technology, Pasadena.

Temper Brittleness of a Nickel-Chromium Steel, by H. P. Nielsen, University of Southern California, Los Angeles.

Metallurgical Problems Confronting the Development of Atomic Energy, by John P. Howe, Knolls Atomic Power Laboratory, U. S. Atomic Energy Commission, Schenectady, N. Y.

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†Papers for two AFS sessions include:

Nodular Graphite in Cast Iron, by E. K. Smith, consulting metallurgist, Los Angeles.

Steel Castings and Their Place in Fabricated Products, by W. A. Saylor, and L. A. Pattison, Consolidated Steel Corp.

April 14, Afternoon

ASM Technical Session

Revealing the Grain Structure of Common Aluminum Alloy Metallographic Specimens, by L. J. Barker, Permanente Metals Corp., Trentwood, Wash.

The Tensile Impact Properties of Some Metals and Alloys, by D. S. Clark and D. S. Wood, California Institute of Technology, Pasadena.

Stainless Steels for Special Services, by V. N. Krivobok, International Nickel Co., Inc., New York.

*AIME Technical Session (To Be Announced)**

AFS Technical Session (To Be Announced)†

April 14, Evening

Dinner-Dance-Entertainment Biltmore Bowl

Friday, April 15, Morning

ASM Technical Session

Ferritic Low-Alloy Boron-Titanium Steel for Use at Moderately High Temperatures, by G. F. Comstock, Titanium Alloy Mfg. Co., Niagara Falls, N. Y.

Testing, by Arthur E. Focke, Diamond Chain Co., Indianapolis, Ind.

Materials Required for Design of High-Speed Airplanes, by T. E. Piper, Northrop Aircraft, Hawthorne Calif.

Boron-Treated Steels, by F. J. Robbins and John Lawless, Plomb Tool Co.

AWS—Codes, Safety, Inspection

Recent Changes in Pressure Vessel Codes, by Elmer O. Bergman, C. F. Braun & Co., Alhambra, Calif.

Proposed Code for the Control of Hazardous Substances, by George A. Sherman, California State Division of Industrial Safety, San Francisco.

Nondestructive Testing of Welded Refinery Equipment, by S. F. Artese, Shell Chemical Co., Wilmington, Calif.

April 15, Afternoon

ASM Technical Session

Fatigue of Metals, by Francis G. Tatnall, Baldwin Locomotive Works, Philadelphia.

Wrinkles in Heat Treating, by G. B. Berlien, Industrial Steel Treating Co., Oakland, Calif.

Influence of Carbide-Forming Elements on Underbead Cracking of Low-Alloy Steel, by R. S. Stewart and S. F. Urban, Titanium Alloy Mfg. Div., National Lead Co., Niagara Falls, N. Y.

SNDT—Petroleum Refining and Sonic Techniques

April 15, 4:00 P.M.

ASM—Metallography

Metallography of the Stainless Steels, by Keith F. Finley, Northrop Aircraft, Hawthorne, Calif.

Exhibitors in Western Metal Exposition

Shrine Civic Auditorium, Los Angeles, April 11-15, 1949

Acme Associates, Inc.
Acme Blower & Pipe Co., Inc.
Acme Manufacturing Co.
Air Reduction Pacific Co.
Air Reduction Sales Co.
Allen Manufacturing Co.
Allison Co.
American Gas Furnace Co.
American Machine & Metals, Inc.
American Steel & Wire Co.
American Wheelabrator & Equipment Corp.
Ampco Metal, Inc.
Austenal Laboratories, Inc.

Baldwin Locomotive Works
Barnes Co., W. O.
Bayer Co., A. J.
Beardsley & Piper Co.
Beets Co., Henry N.
Blakeslee & Co., G. S.
Bowman Chemicals, Inc.
Brown Instrument Co.
Bruning Co. Inc., Charles
Bryant Heater Co.
Buehler Ltd.
Burg Tool Mfg. Co.

Carnegie-Illinois Steel Corp.
Cherry Rivet Co.
Clinton Machine Co., Inc.
Coffing Hoist Co.
Cold Metal Products Co.
Columbia Steel Co.
Commander Manufacturing Co.
Crucible Steel Co. of America
Cyclone Fence Div.

Dayton & Bakewell
Dayton Foundry
Dearborn Chemical Co.
Demmler & Bros., Wm.
Despatch Oven Co.
Detrex Corp.
Detroit Electric Furnace Div.
Diamond Machine Tool Co.
Diversey Corp.
DoAll Co.
DoAll Western Co.
Dow Chemical Co.
Ducommun Metals & Supply Co.

Eclipse Fuel Engineering Co.
Edwards, Inc., S. H.
Electro Refractories & Alloys Corp.
Erb and Gray
Eutectic Welding Alloys Corp.
Everede Tool Company

Far-Best Corp.
Ferner Co., R. Y.
Finishing Publications, Inc.
Freeman Co., C. E.

Gear Engineering & Mfg. Co.
General Metals Corp.
Gerrard Steel Strapping Co.

Hammond Machinery Builders, Inc.
Handy & Harman
Hardinge Brothers, Inc.
Harvey Machine Co., Inc.
Hastings Distributors
Haynes Stellite Co.
Hobart Brothers Co.
Houghton & Co., E. F.

Illinois Testing Laboratories, Inc.
Immersion Heating Equip. Co.
Independent Foundry Supply Co.
International Nickel Co., Inc.
Iron Age

Janney Cylinder Co.
Jenkins Publications, Inc.

Kaiser Co., Inc.
Kelite Products, Inc.
Kent Co., Inc.
Kenu Products Co.
Knapp Co., James H.
Kropp Forge Co.
Kuhlman Electric Co.

Leeds & Northrup Co.
Leekley-Hergenrather & Associates
L'Hommedieu & Sons Co., Charles F.
Lincoln Electric Co.
Lindberg Engineering Co.
Lindberg Steel Treating Co.
Linde Air Products Co.
Los Angeles Dept. of Water & Power
Los Angeles Steel Casting Co.

Magnaflux Corp.
Materials Service Co.
Milne & Co., A.
Minneapolis-Honeywell Regulator Co.

National Carbon Co., Inc.
National Supply Co.
National Tube Co.
Natural Gas Bureau
Natural Gas Equipment Inc.
North American Philips Co., Inc.
Norton Co.

Oakite Products, Inc.
Ohio Crankshaft Co.
Pacific Industrial Mfg. Co.
Pacific Scientific Co.
Pacific Tube Co.
Pangborn Corp.
Partlow Corp.
Peck Steel & Die Supply
Perry Kilsby, Inc.
Phelps Dodge Copper Products Corp.
Physicists Research Co.
Production Machine Co.

Revere Copper & Brass, Inc.
Richards Co. J. A.
Riehle Testing Machine Div.
Ryerson & Son, Inc., Jos. T.

Sheldon Machine Co., Inc.
Simonds Saw & Steel Co.
Smith Corp., A. O.
Snyder Foundry Supply Co.
South Bend Lathe Works
Southern Calif. Metal Spinning Co.
Spar-Tan Engineering Co.
Spencer Turbine Co.
Standard Electrical Tool
Stuart Oxygen Co.
Superweld Corp.
Surface Combustion Corp.

Tempil Corp.
Tennant Co., G. H.
Texas Co.
Tinnerman Products, Inc.
Tivit Products Co.
Tornquist Machinery Co.
Torrance Steam Cleaner Co.

Union Carbide & Carbon Corp.
U. S. Electrical Motors, Inc.
United States Steel Corp.
United States Steel Supply Co.
Utility Steel Foundry

Vapor Blast Mfg. Co.
Victor Equipment Co.

Webster Engineering Co.
Welding Cable Headquarters
Welding Engineering Co.
Wells, Inc., Martin
Wells Mfg. Co.
Western Machinery & Steel World
Western Metals
Westinghouse Electric Corp.
Whiting Corp.
Withrow Co., Arthur C.
Wyman-Gordon Co.

Yale & Towne Mfg. Co.

The photograph at left shows the facade of the Shrine Civic Auditorium in Los Angeles, where the Western Metal Exposition will be held concurrently with the Western Metal Congress. The entire floor area and balcony will be occupied by displays and products of the firms listed above.

The Biltmore Hotel in downtown Los Angeles is headquarters for the Congress. Hotel reservations should be addressed to Allen K. Pollock, manager, Convention and Visitors Bureau, Los Angeles Chamber of Commerce, 1151 South Broadway, Los Angeles 15, Calif.

Metals Review's Honor Roll of the Well Informed

The following readers returned correct answers to the quiz page in the January issue of Metals Review. To earn a place on this honor roll, turn in page 56 and test your own knowledge of current events in the metal industry.

H. C. Ahl, metallurgical engineer, Ohio Brass Co.; E. A. Anderson, supervisor of methods, Chicago Manufacturing Division, Revere Copper and Brass, Inc.; W. Arsenault, heat treater, Stowell Screen Co.

F. E. Bacon, librarian, Union Carbide and Carbon Research Laboratories; Edward J. Badwick, graduate student, Polytechnic Institute of Brooklyn; Frank J. Biersach, service metallurgist, Carnegie-Illinois Steel Corp.; Oscar J. Binder, metallurgical department, Brite Mfg. Co.; Dale Bittinger, assistant superintendent, sheet mill, Jessop Steel Co.; S. G. Blowers, toolsteel salesman, MacInnes Steel Sales Co.; G. W. Boyd, associate professor, Michigan College of Mining and Technology; Robert J. Breska, foundry superintendent, Thomas & Skinner Steel Products Co.; Charles F. Brown, superintendent, Metlab Co.; Frederick E. Busemann, chemist, E. I. du Pont deNemours & Co.

C. H. Campbell, research engineer, American Steel & Wire Co.; Victor Caron, metallurgical engineer, Bureau of Mines; E. J. Casselman, research engineer, Eversharp, Inc.; Keith Charters, salesman, Harrington Tool & Die Co.; R. E. Christin, chief metallurgist, Columbus Bolt & Forging Co.; Walter H. Clark, metallurgist, LeRoi Co., Cleveland Division; Dwight B. Collyer, metallurgist, National Tube Co.

Gerard J. Davidse, metallurgist, Allegheny Ludlum Steel Corp.; L. Y. Deuchler, metallurgist, Mullins Mfg. Co.; Gerritt de Vries, metallurgist, U. S. Naval Proving Ground; F. E. Dowling, metallographer, Ladish Co.

Francis E. Erickson, metallurgist, Pratt & Whitney Aircraft; Leon Eriv, research assistant, Fritz Engineering Laboratory, Lehigh University.

Chester M. Ferris, metallurgist, Pratt & Whitney Aircraft Division; James L. Foster, metallurgist, Wheel & Brake Division, Goodyear Aircraft.

E. Gordon, chief metallurgist, Reeves Instrument; Robert E. Gould, Raytheon Mfg. Co.

E. A. Hall, heat treat foreman, Schwitzer-Cummins Co.; Harold T. Harrison, research metallurgist, National Cash Register Co.; K. Stanley Hawkins, mechanical engineer, Cleveland Diesel Engine Division, Navy Department; David C. Heckard, metallurgical laboratory assistant, Armco Steel Research Laboratory; Carl T. Hewitt, chief metallurgist, Fafnir Bearing Co.; U. F. Hicks, general foreman, General Aluminum Supply Corp.; R. W. Hills, sales, Carborundum Co.; P. S. Hoffman, metallurgist, Treadwell Engineering Co.; Frank H. Holmes, Lt. Col., Munitions Board.

S. V. Jablonski, engineer, Lincoln Electric Co.

Walter C. Kahn, Jr., assistant technical director, New York Testing Laboratories; Anthony Klinshaw, hammerman, Worthington Pump Co.; Andrew F. Koctur, metallurgist, Electro-Motive Division, G.M.C.

I. R. Lane, Jr., junior engineer, Seaboard Air Line Railway; Bert R. Lanker, chief metallurgist, Farrell-Cheek Steel Co.; L. A. Lanning, New Departure; V. J. Lazar, Jr., metallurgist, Philadelphia Naval Shipyard; William H. Leitton, manager, electric products division, U. S. Time Corp.; Roland L. LeVaughn, metallurgical engineering, Vanadium Corp. of America; C. C. Linstead, information officer, Edgar Allen & Co., Ltd. (Sheffield, England); Max Linza, Jr., student, Utica Tech.; Robert St. Clair Low, powder metallurgist, Baker & Co., Inc.

Donald E. Matthieu, assistant to superintendent, Southern Wheel Division, American Brake Shoe Co.; James J. McCarthy, Bethlehem Steel Co.; Robert P. J. McCarty, president, Robert P. J. McCarty & Sons, Inc.; John Morosini, sales engineer, D. A. Stuart Oil Co.

Frank G. Norris, metallurgist, Wheeling Steel Corp.

G. Birger Olson, engineer, General Electric Co.; Raymond N. Outzs, student, Case Institute of Technology.

Rinaldo A. Paci, metallurgical technician, E. F. Houghton & Co.; Charles H. Parcells, manufacturing research division, International Harvester Co.; R. M. Paxton, Jr., department sales manager, Edgcomb Steel Corp.; David W. Pettigrew, Jr., research engineer, Aluminum Research Laboratories; Edward C. Prow, superivsor, Steel Heddle Mfg. Co.; John T. Purslow, assistant metallurgist, Buckeye Steel Castings Co.

Sheldon P. Rideout, metallurgist, Ladish Co.; Gerwin Blake Riding, metallurgist, Geneva Steel Co.; S. S. Rice, engineer, Ohio Brass Co.; Harry F. Ross, research engineer, Battelle Memorial Institute; E. H. Rossell, Royal Canadian Air Force; Carl H. Rowsing, metallurgist, Panama Canal.

Jacques J. Schrinner, metallurgist, General Electric Co.; John D. Senchal, production engineer, Consolidated Venetian Blind Co.; Gordon Shaw, chief draftsman and plant engineer, Canadian White Pine; John D. Sheley, metallurgist, Black Clawson Co.; Thomas W. A. Shultz, student, New York State Institute of Applied Arts and Sciences; G. H. Silver, metallurgist, Monarch Machine Tool Co.; Harold Smallen metallurgist, U. S. Navy, E. L. Spanagel, engineer, Rochester Gas and Electric Co.; E. H. Stilwill, staff metallurgist, Dodge Division, Chrysler Corp.

R. C. A. Thurston, metallurgist, Canadian Bureau of Mines; Everett R. Turner, engineer trainee, Algoma Steel Corp.

Greswold Van Dyke, metallurgist, H & B American Machine Co.

Harold Wiedemann, Jr., metallurgist, W. M. Chace Co.; George E. Wiegert, assistant metallurgist, Goodman Mfg. Co.; William Wilson, Jr., research metallurgist, Armour Research Foundation; Robert H. Witt, metallurgist, Sperry Gyroscope Co.

Luke A. Yerkovich, graduate assistant, Michigan State College; Marshall V. Yokelson, metallurgist, General Cable Corp.

L. Ziffrin, vice-president, Baker Furniture Co.; Chris P. Zillich, assistant metallurgist, American Forge Division, American Brake Shoe Co.

Turn to page 56 for this month's quiz

Metallurgists' First Use of Radioactive Tracers was to Study Diffusion

Reported by John A. Rassenfoss

Research Metallurgist
American Steel Foundries

With the use of an atomic pile, the percentage of a given element in an unknown substance can be determined to an accuracy of 5% even though the element in question is present in quantities of only a few parts per million. Such a method of analysis can be employed for any one of 60 of the known elements. This was one of the many interesting facts revealed in an address entitled "Atomic Tracers" presented by Harrison Brown before the Jan. 11th meeting of the Calumet Chapter.

The speaker, who is associate professor, Institute of Nuclear Studies, University of Chicago, described many other unusual feats which have been or can be accomplished by atomic radioactivity. With some of these methods it is now possible to gain information not previously obtainable. For instance, the above highly sensitive analytical method has been used for the determination of rare elements in meteorites.

One of the first uses of radioactive isotopes in metallurgical research was the study of diffusion phenomena in the solid state. A control operation which the metallurgist can perform with atomic tracers in the form of a radioactive isotope is the measurement of liquid levels in containers where a window or electrical device is not practical. For instance, a very small amount of carbon 14 dissolved in molten metal can serve as a means of measuring the liquid level in a blast furnace or ladle.

Dr. Brown emphasized that care must be taken to analyze the dangers from radioactivity in a proposed research or control application so that serious or fatal damage to the health of those involved may be avoided. In fact the greatest deterrent to the development of lightweight atomic powerplants for high speed transportation devices such as airplanes and automobiles is the weight of protective material necessary.

Use of atomic tracers in metallurgical research is in its infancy, the speaker pointed out, and so far very little work has been done.

President Is Speaker

At the National Officers' Night Meeting of the Mahoning Valley Chapter A. S. M. on Jan. 11, H. K. Work (Left), National President, Spoke on "Cold Working of Metals". At right is Karl Fetters of Youngstown Sheet and Tube Co. (Reported by J. G. Cutton; photo by Henry Holberson)

Canadian Jet Engine Described

Winnett Boyd (Third From Left) Elucidates a Point Having to Do With Jet Engine Materials. Left to right are Raymond E. Barton, treasurer of the Western Ontario Chapter; Frank H. Floyd, chapter chairman; Mr. Boyd, the speaker; D. E. Bothwell, who conducted a tour of International Harvester Co. in the afternoon; Woodleigh B. Turner, vice-chairman; and J. Roy Toll, secretary of the Western Ontario Chapter

Reported by Arthur J. Hughes
Melting Superintendent
Quality Steels of Canada, Ltd.

The Chinook, Canada's first jet engine, was the subject of a talk given by Winnett Boyd, chief designer of A. V. Roe Canada Ltd., to the Western Ontario Chapter A.S.M. at a meeting held in Chatham on Jan. 21.

The speaker illustrated his talk with lantern slides, charts and samples, and explained the difficulties met in the experimental stages. Design, building and performance of the engine were traced step by step.

During the afternoon some 40 members took advantage of a plant visitation to the Chatham Works of the International Harvester Co., Ltd. They were greeted by D. E. Bothwell, general manager, and Mr. Boxall, personnel director, who, with the assistance of guides, explained in detail the workings of this up-to-the-minute plant, which has been in operation only a few months.

German Science Reports Issued

Thirty-two volumes of a projected 84-volume "FIAT Review of German Science, Allied Edition" are now available in the United States, according to announcement by John C. Green, director, Office of Technical Services, Department of Commerce. Included are reports on "Nonferrous Metallurgy—Part I" and "Physics of Solids — Parts I and II". Price is $3.00 per volume. Each volume contains an introduction and a table of contents in English. Main text of the reports is in German.

South Africa Boasts Growing Steel Industry And Extensive Mines

Reported by F. R. Anderson
Chief Metallurgist, Gardner-Denver Co.

Metallurgical status of South Africa was interestingly described by Telfer Norman, metallurgical engineer for Climax Molybdenum Co., at the December meeting of the Rocky Mountain Chapter A.S.M.

The gold and diamond mining activities of South Africa are well known for their fabulous value and great extent of operations. Now, said Mr. Norman, exploratory drilling has disclosed a gold bearing area possibly as extensive as the one for which the district is famous. The great extent of the base metal mines was also described, particularly those of Northern Rhodesia and the Belgian Congo.

The speaker told of the industrial growth of the area and its relation to the budding steel industry there. Johannesburg and the surrounding area are favored with iron ore, a fair grade of coking coal and a good water supply, the essentials for an integrated steel production. This production is expanding rapidly and industrial growth is geared to it.

Sound pictures gave the audience an insight into some of the physical and social features of this rapidly developing area.

Many questions were raised by the audience, and it was agreed that all would appreciate such a trip.

THIRTY YEARS AGO

After a short life as independent organizations, the Steel Treating Research Society and the American Steel Treaters Society merged in 1920 to form the present American Society for Metals. The early issues of the official publications of these two societies (1917-1920) are filled with nostalgic and historical associations.—Ed.

—30—

A grade of membership in force in the early days was designated "associate". Salesmen were entitled to join the society in this category and had the privilage of paying $5.00 higher dues than the "active member" classification, but were not entitled to vote nor hold office. Dues for active members were—then as now — $10 a year.

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An article in the second issue of the *Journal* tells about the increasing use of electric furnaces for steel melting. The first electric furnace was installed at Halcomb Steel Co. (now Halcomb Works of Crucible Steel Co.) in 1906, and its use there was promoted by two prominent A.S.M. members, namely John A. Mathews, later to become an honorary member of the society, and Richard S. Read, a charter member of the Syracuse Chapter.

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The second electric furnace was installed at Firth-Sterling Steel Co., McKeesport, Pa., and the third in 1909 at the South Chicago Works of Illinois Steel Co. The author tells how the department had grown to a battery of five furnaces at the South Works, and describes the duplexing and triplexing processes for electric steel manufacture.

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Under "Personal Items" in the *Proceedings* we note that "A telephone has been installed in the Detroit office and the number is Cadillac 6617."

—30—

In the same issue the Honor Roll lists as members of the Armed Forces: Stanley P. Rockwell, originator of the Rockwell hardness testing machine and recipient of the A.S.M. Sauveur Achievement Award in 1939; H. B. Knowlton, long active in the early "Recommended Practice Committees" of the society and currently chairman of A.S.M. Educational Committee; Capt. D. J. Demorest, long-time head of the metallurgy department at Ohio State University and first life member of the A.S.M.

Cast Iron Varies Pittsburgh Diet

Pittsburgh Members Switched From Steel to Cast Iron at the January Meeting, Addressed by Tracy C. Jarrett (Center). At left is F. H. Allison, Jr., technical chairman; and at right, T. W. Merrill, chapter chairman

Manufacturing Methods For Improved Cast Iron Piston Rings Outlined

Reported by C. T. Haller
International Nickel Co., Inc.

A change from their ordinary diet of steel was provided for Pittsburgh Chapter members on Jan. 13, when Tracy C. Jarrett, manager of engineering and research, Piston Ring Division, Koppers Co., Inc., talked on "Modern High-Strength Cast Iron".

Dr. Jarrett discussed various structures that provide wear resistance and high physical properties. In general, the properties of cast iron can be altered in one of three ways: (*a*) improving the graphite particle size and distribution; (*b*) improving the matrix by alteration of the composition or by a change in cooling rate after casting; (*c*) improving the matrix by a subsequent heat treatment that alters the as-cast structure.

There are two methods of improving graphite particle size and distribution. One involves favorable wear resistance afforded by A.S.T.M. Types A or B graphite flake distribution as compared to the formation of graphite in dendrites. The second is the improvement of strength and ductility by the formation of graphite nodules rather than flakes. In the latter connection, Dr. Jarrett referred to recent papers by Morrogh and Williams and by Morrogh and Grant (see leading article in this issue, page 5). Such cast iron, he said, would be a distinct threat to steel and malleable iron castings.

Dr. Jarrett then summarized the developments leading toward the most recent piston ring composition. The research division of the Koppers Co. had observed that a desirable wear resistant structure for a piston ring should consist of a coarse pearlite matrix and large graphite flakes. The present rings are melted in an induction furnace and centrifugally cast (white) in permanent molds. They vary in size from 2½ to 12½ in. in diameter and up to 14 in. long. The cast rings are then heat treated by holding 4 hr. at 1750° F. in a controlled-atmosphere furnace. They are pit cooled at a very slow rate to a hardness of Rockwell B-95 to 100, and have an elongation of 2 to 4%.

F. H. Allison, Jr., United Engineering and Foundry, subsequently led an active discussion covering some problems on the hardness, wear resistance and structure of various types of cast iron.

Prior to the meeting, Chairman Tim Merrill welcomed the following new sustaining members: Hubbard and Co.; Summerill Tubing Co. Division of Columbia Steel and Shafting Corp., and Blaw Knox Construction Co., Chemical Plants Division.

Student Affiliate Formed At University of Kentucky

Reported by Richard J. Beaver
University of Kentucky

The inaugural meeting of the University of Kentucky Student Affiliate of the Louisville Chapter A.S.M. was addressed by W. S. Benninghoff on Jan. 3.

Sincere interest, work and generosity on the part of the officers and members of the Louisville Chapter sped the interested students of the University to this embarkation point. The contributing interest shown by the chapter, the encouragement given by the faculty of the department of metallurgy and the administration of the University, together with the endeavor of the students, made quick work of the preliminaries. The charter members of the affiliate group are aware of the benefits which this relation with such an organization can mean.

Surface Protection Among Advantages Offered by Salt Bath

Reported by Harry A. Johnson
Gear Engineer
Aircooled Motors, Inc.

Both the merits and shortcomings of salt baths were explained by William Adam, Jr., vice-president of Ajax Electric Co., speaking before the Syracuse Chapter on Jan. 4.

Among the benefits, he cited the surface protection given the work not only when first placed in the bath but also in the transfer to the quench by virtue of the liquid protective film of salt covering the work. Other advantages are the avoidance of all temperature shock because of the "cocoon" of frozen salt formed on the work which amounts to an automatic preheat; the uniformity of heating with avoidance of any shading effect; a minimum of distortion because the buoyancy of the bath supports the work; and the rapid rate of heating, which permits the use of relatively small furnaces occupying little floor space.

Furnaces heated by immersed electrodes range from small batch-type units to huge mechanized installations in which the work, supported on fixtures, is handled in automatic sequence through the salt bath, quench, draw and washing operations. Submerged electrodes are used in the newest design of furnace with baths up to 20 ft. deep.

The various heat treating operations for which salt baths have found widespread use include carburizing, cyaniding, neutral hardening; interrupted quenching treatments involving austempering, martempering, and cyclic annealing; process annealing of coiled wire; solution heat treating of aluminum alloys; descaling of stainless steel products; and cleaning deposits from molds used in the rubber industry.

Of special interest was an operation in which salt bath brazing and carburizing are combined in one step. A unique application of cyclic annealing involves utilizing the residual heat in steel forgings as they come from the hammer or press.

To obtain successful results in martempering or austempering, an isothermal quench bath should be designed to provide adequate cooling to dissipate the heat from the hot work entering the bath, as well as a vigorous directional agitation of the liquid salt on the work being quenched.

C. T. Patterson gave a short coffee talk in which he called attention to interesting chemical behavior and phenomena in connection with water and ice at varying temperatures and pressures.

Rome Panel Covers Unusual Methods in Deep Drawing, Forging, Differential Rolling

Reported by R. C. Dalzell
Chief Technical Advisor
Revere Copper and Brass, Inc.

Operations and methods of unusual interest ranging from the differential rolling of silverware to the forging of gas turbine buckets and blades were described during a panel discussion on the working of metal staged by the Rome Chapter A.S.M. in January. Panel Chairman L. E. Gibbs gave each of the four speakers 15 min. for his presentation, followed by questions from the audience.

Stuart R. Eades of Revere Copper and Brass, Inc., the first speaker, described the unusual properties of Ampco bronze No. 22 dies for the drawing of stainless steel. With these dies a water soluble lubricant can be used, whereas with steel or carbide dies heavy lubricants are necessary, which are difficult to clean out. These dies are used for the many reverse deep drawing operations on stainless steel cooking utensils.

In the manufacture of the 40-mm. cartridge case from 1025 steel, Eades said, the best lubricant appeared to be ordinary soap applied as a water solution and then dried. When the shell gets too deep for the soap to dry satisfactorily, an alternate method is to give a slight bonderize (about 15 sec.) to provide a surface that will hold a water soluble drawing compound.

Burster tubes are being made from electrically welded steel tube. The end is spun-welded shut following a high frequency induction preheat. An oxyacetylene torch is used to weld the end completely.

William M. Hinton of the same company then took the floor and discussed the forging of aluminum-base, copper-base, and magnesium-base alloys. Colloidal graphite is a popular lubricant for these hot operations, although it is somewhat difficult to remove from aluminum and magnesium.

Mr. Hinton emphasized the importance of designing to avoid right angles or ribs that are too tall, and of using wrought materials for forgings rather than cast. All parts of a forging are not worked equally, and some of the cast structure might remain in the forging.

Economies may often result from using extruded shapes instead of rod. Particularly in aluminum alloys, a difference in physical properties of the finished forging has been noted, depending on whether the rod stock was rolled or extruded.

Unique methods are used in the manufacture of sterling silver and silver-plated flatware and hollow ware, according to Walter Moulton of Oneida Limited. Differential rolling with eccentric rolls was described in some detail.

In the manufacture of knife handles clearances are carefully controlled so that silver solder flows by capillarity as much as 8 in. from the point at which it is introduced. Induction heated silver brazing is being developed to replace soft soldering for attaching the knife blade in the manufacture of good quality plated ware, the speaker said.

Problems that are involved in the manufacture of buckets and blades for gas turbines were then described by John M. Fox, Jr., Utica Drop Forge & Tool Corp. The forging stock is purchased from steel companies, although some of it contains as little as 4% iron. Amazing combinations of metals are often used, and Fox said that really little of the metallurgy has been worked out accurately. Each new alloy presents new forging problems which must be solved in the shop. While as recently as five years ago, bucket life in the hot end of the turbine was considered good at 50 hr., engines have now been approved for 300 hr.

Precision manufacture is necessary and no machining of the airfoil sections is permitted after the forging operations are completed. The stress at the root of the blade is in the neighborhood of 30,000 to 35,000 psi. at the 1500 to 1800° F. operating temperatures. With the rotors revolving at 11,000 to 14,000 r.p.m., breakage of even one blade cannot be tolerated. Grain size control is extremely important and extremely difficult on these alloys.

Compressor blades require the same precision in manufacture but do not have to withstand the high temperatures of the turbine blades. Titanium holds great promise in this field because of its light weight and high physical properties.

Mr. Fox expressed great interest in Mr. Moulton's description of differential rolling in the silverware industry. The newest idea proposed for the manufacture of turbine blades, he said, is to adopt this flatware technique as a substitute for some of the forging operations.

Steel Costs Analyzed

Harry McQuaid Speaking at Detroit

Reported by H. H. Benninger
Peninsular Steel Co.

A lecture woven around the economics of the steel industry, as viewed by both producers and consumers, was presented by Harry W. McQuaid, consulting engineer, before the Detroit Chapter on Jan. 10.

His comments dealt in part with the cost of steel as determined by the cost of labor, transportation and taxes—the largest items in finished steel prices. But the speaker dealt in still greater detail with the effect on steel prices that could be brought about by the metallurgical engineer through such considerations as reducing mill returns, elimination of all except essential mill finishing, stepping up the speed of steel melting and refining. Sensible increases in steel output could be realized, said Mr. McQuaid, by simply analyzing in greater detail the quality requirements of individual parts, and producing steel of that quality.

At the coffee talk held in conjunction with the dinner, Robert S. Drews gave a phychiatrist's view of "What Is a Normal Person". Some of the members were heard to voice long-hidden doubts regarding bosses, wives, and fellow-workers immediately after Dr. Drew stopped talking!

Dedication of White Oak X-Ray Lab March 24-25

A symposium on nondestructive testing will feature the dedication of the million-dollar White Oak X-Ray Laboratory of the U. S. Naval Ordnance Laboratory at Silver Spring, Md., March 24 and 25.

The formal dedication ceremony will be held Thursday morning, March 24, and will be followed by a tour of the X-ray laboratory and nondestructive testing exhibits. Technical sessions will be held Thusday afternoon and Friday morning and afternoon.

Attendance at the symposium by any member of the American Society for Metals will be welcome. Members will also be given an opportunity to see all parts of the 1000-acre White Oak campus where 2300 people are employed.

Further information about the program may be obtained from Leslie W. Ball, chief, mechanical evaluation division, U. S. Naval Ordnance Laboratory, White Oak, Silver Spring 19, Md.

Addresses Penn State Chapter and Students

L. L. Ferrall, Director of Metallurgy, Crucible Steel Co. of American, Discussed the Subject of Testing of Steel at the Evening Meeting of the Penn State Chapter on Jan. 11. In the afternoon, before all of the undergraduates, he described the field of metallurgy in his particular industry. In the photograph, left to right, are Harold J. Read, acting chief, division of metallurgy, Pennsylvania State College; James H. Keeler, chapter chairman; Mr. Ferrall; and H. M. Davis, associate professor of metallurgy. (Reported by F. R. Lorenz, Jr.)

Experiments in Welding Prove Benefits of Preheat and Postheat

Reported by W. G. Fassnacht
Assistant Chief Metallurgist
Bendix Products Division

Some experiments in arc welding were described by R. D. Stout of Lehigh University, speaking before the Notre Dame Chapter A.S.M. in a joint meeting with the American Welding Society on Dec. 8.

The experiments were made by laying beads on a plate of structural steel before and after various heat treatments and checking the properties of the base metal by placing a notch transverse to the bead and testing the plate in bending over a range in temperatures. The benefits of postheating and preheating were quite obvious, and surprisingly great for a steel that is nominally nonhardenable.

The most serious welding defects are cracks which occur parallel to the bead. These are of two types, one of which goes down the center of the weld bead, and is caused primarily by shrinkage stresses. The other, called under-bead cracking, is found in the heat-affected zone of the base metal and apparently occurs only when three conditions are present, namely, hydrogen, a hardness above 350 Brinell (Rockwell C-37), and constriction in the assembly. If any one of these conditions is absent, cracking can be prevented.

The first item is controlled by using rods with the so-called lime type, or low-hydrogen, coating. The second is minimized by proper preheating and postheating. The last one can be varied by jigging methods and weld sequence. Proper control of these items enables steels of such high hardenability as S.A.E. 4340 to be successfully welded.

Technical Papers Invited

The Publications Committee of the A.S.M. will now receive technical papers for consideration for publication in the 1950 *Transactions.* A cordial invitation is extended to all members and nonmembers of the A.S.M. to submit technical papers to the society. Many of the papers approved by the committee will be scheduled for presentation on the technical program of the 31st National Metal Congress and Exposition to be held in Cleveland, Oct. 17 to 21, 1949. Papers that are selected for presentation at the Convention will be preprinted and manuscripts should be received at A.S.M. headquarters office not later than April 15, 1949.

Manuscripts in triplicate, plus one set of unmounted photographs and original tracings, should be sent to the attention of Ray T. Bayless, assistant secretary, American Society for Metals.

Headquarters should be notified of your intention to submit a paper, and helpful suggestions for the preparation of technical papers will be sent.

Titanium Alloy With 12% Nickel Shows Practical Promise

Reported by Melvin R. Meyerson
Metallurgist
National Bureau of Standards

A comprehensive program of research on titanium and its alloys is being carried out at the Bureau of Mines in College Park, Md. This program was described by James R. Long, head of the physical metallurgy section at the Bureau, speaking before the Washington Chapter A.S.M. on Jan. 10.

Titanium possesses three virtues as a metal—namely, strength (126,000 psi. in the cold worked condition, and 82,000 annealed), lightness (specific gravity 4½), and corrosion resistance (somewhat better than stainless steel).

At present titanium metal is manufactured by the reduction of titanium tetrachloride with molten magnesium. The titanium thus obtained by the Bureau of Mines is in the form of powder and is consolidated by powder metallurgy methods. Since, unlike most metals, titanium dissolves in its own oxide above 700° C. and is thereby embrittled, sintering is done in a vacuum. The vacuum-sintered material approaches the theoretical density after 30% reduction by cold working. Consolidated metal is also produced by the hot rolling, at 900° C., of green powder compacts that are sealed inside iron sheaths.

A phase change from alpha to beta occurs at 875° C. If a quenched specimen of titanium is microscopically examined and is found to have a polyhedral structure only the alpha form has been present. If the specimen has a Widmanstatten structure the beta form has been present.

Of several titanium-rich alloys which have been investigated, the titanium-nickel series has been brought to the highest level of knowledge. Actually, these are titanium-nickel-oxygen alloys for they contain 0.1 to 0.2% oxygen which is difficult to remove or detect by present-day vacuum fusion methods.

The Ti-Ni alloys are made at the Bureau of Mines by mixing the metal powder in desired proportions, pressing, and without sintering, enclosing in iron sheaths and working at temperatures between 800 and 1000° C. The alloys containing up to 12% nickel will prove to be the most practically useful, the speaker ventured. A tentative equilibrium diagram of the binary titanium-nickel system was shown.

Near the conclusion of the meeting Mr. Long, as feature speaker, was asked to draw from a hat the name of the recipient of the door prize. Mr. Long obligingly drew his own!

Fatique Properties Evaluated From Laboratory Tests

Reported by Robert T. Hook
Assistant Metallurgist
Warner & Swasey Co.

The standard fatigue test relies upon an ideal test specimen which seldom simulates service conditions. Nevertheless, the design engineer gets useful information on the fatigue properties of metals as determined from laboratory tests, George R. Gohn of Bell Telephone Laboratories told the Cleveland Chapter A.S.M. at the January meeting.

In general, a highly polished specimen is tested either in bending (rotating or cantilever beam), tension, compression or torsion under conditions of constant deflection or constant load until failure occurs. This test yields an ideal fatigue strength which cannot be used without a factor of safety, the magnitude of which can only be determined from valid life test data. Here we run into the old barrier, namely, the difficulty in calculating stresses in the machine elements. Notch fatigue data are highly essential but how can we apply them if we do not know how to calculate stresses in the parts of our machines?

While it is possible to increase the fatigue strength of a metal by heat treatment or cold working, it should be remembered that the harder materials are usually more notch sensitive and hence under corrosion conditions they may be no better than a softer, more ductile material. Mr. Gohn showed the variation that could be obtained on the fatigue life of one type of steel, holding the hardness constant but obtaining this hardness by various methods such as austempering, martempering, and quench and temper.

The fatigue life of a material is not a constant. Bollingrath and Bungardt have shown that the repeated bending fatigue strength was 12 to 34% greater than the fatigue strength observed in repeated tension tests on light alloys. Furthermore, it has been shown that the fatigue strength is a function of the surface finish, and for a given finish may be raised by understressing or lowered by overstressing. And, finally, since fatigue starts at areas of high local stresses, the fatigue life of a metal may be affected by such things as nonmetallic inclusions; internal cracks, blowholes or porosity; surface defects; screw threads, sharp or reentrant angles; cracks resulting from heat treatment; and identification or inspection marks.

All of these act as stress raisers and tend to reduce fatigue life but the effect is rarely as great as that estimated from mathematical theory, probably because of the existence of high localized stresses well above those which cause slip. These may cause considerable yielding under repeated stress and tend to relieve the high points of stress concentration rather than to cause the formation of cracks.

While the metallographer has shown how fatigue appears in the early stages and as the crack progresses, neither metallography, X-ray nor any other method has yet shown how, when and where the fatigue crack starts. Hence, today, it is just as necessary as it was a hundred years ago to determine fatigue strength from long-time, expensive fatigue tests.

Lastly, it should be remembered that the fatigue properties of a metal are dependent upon the general quality of the material. This is undoubtedly one of the major factors contributing to reliable performance in fatigue. Coordination of effort between the metal producer and the user is necessary; proper techniques in melting, casting and method of manufacture must be maintained, and correct heat treating techniques must be vigorously observed. Despite the fact that fatigue testing is now 100 years old, the study of fatigue is still relatively young and great advances are likely to be made in future years.

Focke Speaks on Tempering

Cincinnati Chapter Chairman Congratulates A.S.M. Vice-President Arthur Focke on His Talk on Tempering at the Recent National Officers and Sustaining Members Meeting. Other members in the photograph are Al Fischer, Paul Bernert, M. L. Steinbuch, Owen Williams, Joe Kuhr and Earl Dickman. (Reported by Paul A. Bernert, Publicity Chairman)

Transferred by Permanente

Clyde R. St. John has resigned as chairman of the Inland Empire Chapter A.S.M., on being transferred by Permanente Metals Corp. from Spokane, Wash., to Newark, Ohio. His new title is assistant chief metallurgist of the Newark plant.

Chicago Hears President

Reported by Norman O. Kates
Metallurgist, Lindberg Steel Treating Co.

Speaking on "Research in Steelmaking," Harold K. Work, national A.S.M. president, was enthusiastically received by the Chicago Chapter "National President's Night," on Jan. 17. Dr. Work discussed the use of semi-plant scale equipment for research purposes, plus the factors affecting cold working properties of deep drawing steels.

In the absence of Secretary Bill Eisenman, Dr. Work preceded the technical discussion with a number of selected anecdotes, and it was generally felt that the humor department is in good hands.

N. J. Secretary Changes Position

Henry F. J. Skarbek, secretary of the New Jersey Chapter A.S.M. and formerly assistant chief engineer for Breeze Corporations, Inc., is now plant engineer for American Aluminum Castings Co. of Irvington, N. J.

Lindberg Opens New Office

Lindberg Engineering Co. Chicago, has established a new West Coast office at 5531 South Vermont St., Los Angeles. Stuart K. Oliver, formerly in charge of the Lindberg office in Cleveland, and a former General Motors metallurgist, has been named manager. Mr. Oliver is a past chairman of the Dayton Chapter A.S.M.

The new office will serve the states of California, Oregon and Washington. Pacific Scientific Co. will continue to handle Lindberg equipment as a cooperating sales agency.

Practical Applications Of Carbonitriding Outstrip Lab Data

Reported by John E. Mitchell
Head Materials and Standards Engineer
U. S. Naval Ordnance Plant

A commanding dissertation on the "Carbonitriding Process of Case Hardening'" was delivered to a near-capacity crowd of Indianapolis Chapter members by Michael B. Bever, associate professor of metallurgy at Massachusetts Institute of Technology.

The term carbonitriding is in a way misleading, the speaker pointed out, because the process is a modification of case carburizing, not a modification of nitriding. To date practical applications have far outstripped the theoretical data, and much laboratory work is still to be done on the process. Such work is progresing at M. I. T. under the sponsorship of Armour and Co.

An outstanding feature of carbonitriding is the lowering of the critical temperature of the case with increases in the nitrogen content. The case nitrogen content can be regulated by the expedient of varying the treating temperature and the ratio of ammonia to carburizing gas. The lower the treating temperature, the higher the nitrogen content. The process can be carried out at temperatures varying from 1200 to 1650° F., with most applications in the 1500 to 1550° range

The automotive industry has been one of the first and most important users of the process, taking advantage of the saving of time, material, and equipment that may be effected. In many applications the lighter cases produced by carbonitriding are as satisfactory as heavier cases produced by carburizing. A further advantage of carbonitriding is that the nitrogen acts like a metallic alloying element in reducing the rate of transformation of austenite, with consequent lower quenching rates. Also, the ammonia content of the furnace atmosphere produces an excellent case on steels that are likely to exhibit spottiness and other undesirable characteristics if pack or gas carburized.

Carbonitrided cases, stated Dr. Bever, produced at temperatures below approximately 1450° F, have a high nitrogen content. They are often brittle and will spall under extreme loads. This is thought to be caused by a white surface layer of carbon-nitrogen-iron compound, similar to the white layer in nitrided steels.

Following the formal address, Dr. Bever led a question and answer period on various phases of heat treating problems related to carbonitriding. Among those who participated were Stanley Souders, chief metallurgist of Chrysler New Castle plant; J. W. Watson, metallurgist, Link Belt Co.; Louis Flesch, metallurgist, and R. H. Stewart, laboratory director, Linde Air Products Co.; John Wagner, metallurgist, Naval Ordnance Plant; A. E. Focke, national vice-president of A.S.M. and chief metallurgist of Diamond Chain Co.; and Bob Peters, chief metallurgist of the Warner Gear Co.

D. A. Nemser Dies, Was Past Chairman Of Hartford Chapter

David A. Nemser, metallurgist and head of the New England technical section of the development and research division of International Nickel Co., Inc., died on Jan. 5 after an illness of several weeks. He was 51 years old.

Before joining International Nickel in 1934, Mr. Nemser was chief metallurgist of the Pratt and Whitney Division, Niles-Bement-Pond, in Hartford. He was a past chairman of the Hartford Chapter A.S.M.

A well-known metallurgist, he did consulting work on problems concerning metallurgy and was an expert on the machining characteristics of alloy steels, a subject on which he often lectured before various technical groups. During World War II, he was a member of the Industrial Advisory Committee of the War Production and Engineering Counsel for Northern Connecticut.

Ernest J. Teichert

Ernest J. Teichert, research assistant at Pennsylvania State College, died on Oct. 18 at the age of 38 as the result of a laboratory explosion. Mr. Teichert, who received his B.S. and M.S. degrees in metallurgy from Ohio State University in 1931 and 1932, was working toward a Ph.D. at the time of his death.

Shortly after graduation from O.S.U. he was appointed supervisor of metallurgy extension at Pennsylvania State College. In this work he wrote three well-known textbooks on ferrous metallurgy and organized and supervised 298 metallurgical extension classes.

A. D. Shankland

A. D. Shankland, metallurgical engineer on the staff of the operating vice-president, Bethlehem Steel Co., died on Jan. 5. Mr. Shankland, a graduate of Virginia Polytechnic Institute, had been with Bethlehem since 1914. He served as engineer of tests from 1934 to 1945, and as assistant general manager of the Bethlehem plant from 1945 to 1946.

Editor Outlines Recent Trends in Materials, Methods

Reported by R. S. Haverberg
AC Spark Plug Division

Recent trends in materials and methods were delineated by T. C. DuMond, editor of *Materials and Methods,* before the Saginaw Valley Chapter A.S.M. on Jan. 18.

Mr. DuMond told how the development of nodular graphitic cast irons, controlled by the use of cerium and magnesium, has increased the tensile properties of ordinary graphitic cast irons from an average of 30,000 psi. to as high as 65,000 psi. High-silicon, growth resistant cast irons have been developed by Battelle Memorial Institute which will withstand cooling from temperatures as high as 1700° F. with a minimum of scaling and other ill effects.

Two new magnesium extruded alloys with chromium as an alloying element have been developed for aircraft use. These alloys have tensile properties of approximately 49,000 psi. as extruded with an increase to 53,000 psi. after aging. Magnesium alloys can now be brazed and chromium plated; however, only one alloy is especially suitable at the present time for brazing.

Cerium alloys are now available in wrought and cast form for aircraft engine parts, and 75S-T, a high-strength aluminum alloy, is being used for aircraft landing gears. The aluminum landing gears have been given a superior wearing surface by direct chromium plating with no undercoating.

Improvements in plastics as to heat resistance, wear properties and chemical inertness have been rapid. Nylon is being used as bearings and bushings without lubrication, and its wear and scoring properties are superior to steel.

An interesting development emanating from England is the cold welding process, which joins materials without external heat by the medium of extreme high pressures.

Printed electrical circuits using silver have greatly simplified and reduced the weight of many electrical appliances. A hearing aid, for example, using a printed circuit has been reduced in weight to 5 oz. including the batteries.

Mr. DuMond stated that the critical steel shortage experienced in the postwar years may now be easing and, although government-sponsored steel mills are advocated, our present capacity will be ample. The greatest obstacle that the steel industry may have to surmount in the near future is the curtailment of manganese shipments from Russia.

Five Main Types of Cast Iron Described And Differentiated

Reported by F. G. Wayman

Asst. Superintendent, Wire Mill Steel Co. of Canada, Ltd.

"To describe the nature of a material which involves an industry producing 20 million tons of castings per year", said E. C. Winsborrow, vice-president of Shawinigan Foundries Ltd., "is a very complex task." The material referred to was cast iron and the occasion was the Jan. 3rd meeting of the Montreal Chapter A.S.M. In the limited time at his disposal, however, the speaker did very well.

Mr. Winsborrow defined cast iron as "a ferrous-base alloy containing so much carbon that it is not malleable in the cast condition". Some of the factors influencing the properties of the five main types of cast iron—gray, white, mottled, chilled, alloy—were described in some detail. The physical properties of cast iron depend not only on the carbon content but also on the size, type and distribution of the various carbon formations. These are controlled in large part by the rate of cooling, analysis, pouring temperature, ladle treatment, and section size.

Gray cast iron is an iron in which at least three quarters of the total carbon content is in the form of graphite, and the remaining carbon, if any, is present as the eutectoid pearlite. It has little ductility but good machinability. Large flake size and poor distribution of the particles adversely affects the physical properties.

White cast iron has all the carbon in the form of pearlite and free cementite and has poor machinability and high hardness. Mottled cast iron, as the name implies, is a mixture of gray and white cast irons. Chilled cast iron, produced by rapid cooling, has high hardness and high compressive strength, ordinarily proportional to carbon content.

Alloys are used in cast iron to modify the physical properties. Increasing the silicon content and holding the section size constant results in an increase in the number of voids, which in turn affects physical properties adversely. Nickel, molybdenum, chromium and cerium are other additions which do much to provide certain desirable physical properties. Heat treated alloy cast irons provide unusual physical properties in gray cast irons when such processes are carefully controlled.

A lively discussion period was led by J. P. Simpson, who acted as technical chairman. The coffee talk which preceded the lecture took the form of a colored sound film, "The Song of Algonquin."

Stainless Sales Division Formed

Establishment of a separate stainless steel sales division, as part of the company's intensified effort in the field of stainless steel wire, bars and strip, has been announced by American Steel & Wire Co. Banks E. Eudy, who headed the stainless steel unit which was the forerunner of the new division, has been named manager of the stainless steel products sales division, and C. Richard Horwedel, a member of the company's metallurgical department since 1930, is assistant manager.

New Mill Goes Into Operation

The new 20-in. continuous hot strip mill erected by Superior Steel Corp., Carnegie, Pa., to replace two older mills, started operation early in January, according to an announcement by E. J. Reardon, operating vice-president. Products of the new mill will include stainless steel strip in widths from 4 to 18 in. and in thicknesses as light as 0.065 in., as well as carbon steel and clad metal strip in widths from 4 to 20 in. and thicknesses down to 0.040 in. Rolling capacity is 10,000 tons per month.

Stainless Fabrication Problems Analyzed

Reported by Arnold S. Rose
Metallurgist, RCA Victor Division

Basing his talk upon an analysis of actual problems in the files of his company, W. B. Pierce, in charge of sales development and engineering service of the Allegheny Ludlum Steel Corp., addressed the York Chapter A.S.M., on Jan. 12. The subject of Mr. Pierce's discourse was "Problems Encountered in the Fabrication of Stainless Steels".

As an introduction Mr. Pierce classified the stainless steels into two broad divisions—the straight chromium and the chromium-nickel types. The former may be further subdivided into the hardenable martensitic grades such as Types 410 and 440, and the nonhardenable grades such as the ferritic Type 446. Similarly, many variations in the chromium-nickel grades are available, each designed to fulfill a special requirement with respect to such properties as weldability, corrosion and heat resistance, machinability, and the not-to-be-neglected factor of cost.

Mr. Pierce, who, as chief of the Stainless Steel Branch of the Steel Division, War Production Board, and in his present capacity, is in everyday contact with fabrication problems of stainless steel, then presented some pertinent and informative comments on such topics as cleanliness and passivation; welding, stress-relief, annealing, and heat-treatment; flame-cutting and machining; forming and deep-drawing; lubrication, pickling, electropolishing, and finishing.

The stringent requirements for absolute cleanliness as a factor in maintaining the corrosion resistance of stainless steel were emphasized, particularly with regard to the role of the passivating treatment. The position of stainless steel in the electromotive series varies considerably, Mr. Pierce pointed out, and is dependent upon the surface characteristics of the metal. If clean and covered by a normally present protective film, the material is most inactive, lying close in position to silver. When the surface is unclean or the protective oxide film broken (such as may occur when it is fouled by free iron or when stored in the presence of volatile acid fluxes), a maximum displacement in its electrochemical position occurs, the stainless now placing next to iron and immediately above tin. Thus, the "rusting" of stainless steels which occurs occasionally following fabrication may be analyzed fundamentally and corrective measures based upon maintenance of surface cleanliness may be instituted.

Following the lively discussion period during which Mr. Pierce commented on some of the members' specific problems, the meeting was brought to a close by Claudis Rohrbaugh, program committee chairman.

Claud Gordon Has New Plant

The Claud S. Gordon Co. of Chicago has completed a new branch plant at 2035 Hamilton Ave, Cleveland 11. The Cleveland manufacturing operations as well as the local sales office have been transferred to the new and larger plant. Facilities include a complete modern service laboratory and equipment showroom. E. W. Romig, vice-president and general manager, is in charge.

Metallurgy Fellowship Given

Receipt of a postgraduate fellowship in metallurgy, believed to be only the second scholarship in that field ever given by the DuPont Company to an American college or university, has been announced by Carnegie Institute of Technology. Robert F. Mehl, director of the Metals Research Laboratory and head of Carnegie's metallurgical engineering department, said the fellowship probably will not be awarded until April or May.

DuPont postgraduate fellowships in physics, chemistry and chemical engineering departments have also been renewed, according to Robert E. Doherty, president of Carnegie Tech.

NATIONAL MEETINGS FOR APRIL

April 2—Engineers Council of Houston. Second Annual Symposium—"The Conservation of Our Natural Resources", Rice Hotel, Houston, Texas. (William Q. Hull, Publicity Committee, Engineers Council of Houston, 2615 Fannin St., Houston 4, Texas.)

April 5-6—Metal Powder Association. Fifth Annual Meeting and Exhibit, Drake Hotel, Chicago. (M.P.A., 420 Lexington Ave., New York 17.)

April 7-8—Ohio Welding Conference. Tenth Meeting, Ohio State University, Columbus, Ohio. (Department of Welding Engineering, Ohio State University, Columbus 10, Ohio.)

April 11-12—American Institute of Electrical Engineers. Conference on the Industrial Use of Electron Tubes, Statler Hotel, Buffalo, N. Y. (Henry F. Dart, chairman, Publicity Committee, c/o Electronic Engineering Department, Westinghouse Electric Corp., Bloomfield, N. J.)

April 11-12—American Zinc Institute. Thirty-First Annual Meeting, Hotel Statler, St. Louis, Mo. (Ernest V. Gent, secretary, A.Z.I., 60 East 42nd St., New York 17.)

April 11-13—Society of Automotive Engineers. Aeronautic and Air Transport Meeting, Hotel New Yorker, New York City. (John A. C. Warner, secretary and general manager, S.A.E., 29 West 39th St., New York 18.)

April 11-13—American Society of Lubrication Engineers. Fourth Annual Convention and Lubrication Show, Statler Hotel, New York. (Mills, Lund & Mann, Inc., 53 West Jackson Blvd., Chicago 4.)

April 11-14—National Association of Corrosion Engineers. Fifth Annual Conference and Exhibition, Netherland-Plaza Hotel, Cincinnati, Ohio. (W. Z. Friend, chairman, Publicity Committee, N.A.C.E., 67 Wall St., New York 5.)

April 11-15—Western Metal Congress and Exposition, Shrine Convention Hall and Biltmore Hotel, Los Angeles, Calif. (W. H. Eisenman, director, Western Metal Congress, 3232 Royal St., Los Angeles 7.)

April 13-16—Electrochemical Society. Spring Congress, Philadelphia. (R. M. Burns, secretary, 235 West 102nd St., New York 25.)

April 18-20—American Institute of Mining and Metallurgical Engineers. 32nd Annual Conference of the Open Hearth Steel Committee and Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division, Palmer House, Chicago. (Ernest Kirkendall, secretary, Room 905, 29 West 39th St., New York 18.)

April 18-20—Eleventh Annual Midwest Power Conference, Sherman Hotel, Chicago. (R. A. Budenholzer, conference director, Illinois Institute of Technology, 3300 South Federal St., Chicago 16.)

April 19-20—Magnesium Association. Annual Spring Meeting and Product Exhibit, Edgewater Beach Hotel, Chicago. (A. J. Peterson, publicity chairman, c/o Apex Smelting Co., 2537 West Taylor St., Chicago 12.)

April 22-23 — Colorado School of Mines. Fifteenth Annual Engineers' Day, Golden, Colo. (J. R. Medaris, chairman of Engineers' Day, Box 147, Golden, Colo.)

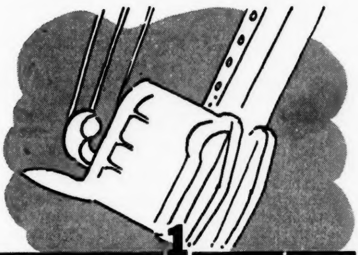
April 25-26—International Acetylene Association. Annual Convention, William Penn Hotel, Pittsburgh. (T. C. Fetherston, chairman, Program, Publicity and Arrangements Committee, I.A.A., 30 East 42nd St., New York 17.)

April 25-28—Fourth Southern Machinery and Metals Exposition, Municipal Auditorium, Atlanta, Ga. (Michael F. Wiedl, managing director, 267 East Paces Ferry Rd., N.E., Atlanta 5, Ga.)

A. S. M. Review of Current Metal Literature

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad, Received During the Past Month

Prepared in the Library of Battelle Memorial Institute, Columbus, Ohio
Ralph H. Hopp, Librarian *W. W. Howell, Technical Abstractor*



1 ORE BENEFICIATION and RESERVES

1A—General

1A-9. Sink-Float Processes. John T. Sherman. *Chemical Engineering,* v. 56, Jan. 1949, p. 106-109, 114-115.

Developments in equipment and procedures. Predicts increasing utilization of such processes.

1A-10. Relationship Between Froth-Forming Properties and Size of Bubbles. (In Russian.) G. P. Mit'kevich. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 21, Aug. 1948, p. 816-819.

Proposes an optical method for studying the dynamics of the process of formation and disintegration of the mass of froth as a whole. The proposed method also permits determination of bubble sizes during the process.

1A-11. (Book). **Textures of the Ore Minerals and Their Significance.** A. B. Edwards. 185 pages. 1947. Australasian Institute of Mining and Metallurgy, Melbourne.

Significant ideas on origin of mineral textures and their application to geological and metallurgical problems. Solid solution phenomena in native metals, oxide minerals, and sulfide, sulfo-salt minerals. Applications include ore geology and ore dressing.

1B—Ferrous

1B-14. Coal and Ore Preparation for 2000-Ton Blast Furnace. Coal. E. J. Gardner. **Ore.** S. Naismith. *Iron and Steel Engineer,* v. 26, Jan. 1949, p. 123-125.

Methods used by Inland Steel Co.

1B-15. Iron Ore Review—1948. M. D. Harbaugh. *Blast Furnace and Steel Plant,* v. 37, Jan. 1949, p. 57-62.

Production and shipment data; new developments in beneficiation and reserves.

1C—Nonferrous

1C-5. Concentrating, Smelting and Research at the Flin Flon Mine. Geo. E. Cole. *Western Miner,* v. 22, Jan. 1949, p. 48-52.

Crushing and grinding, copper concentration, zinc concentration, cyanidation for recovery of gold, zinc casting, zinc electrodeposition, and copper smelting. The research department and its activities.

1C-6. How Much Uranium Have We? *Metal Progress,* v. 55, Jan. 1949, p. 47.

Discusses contradictory statements on the above subject by various responsible men.

1C-7. Changes in the Wettability of Metals and Sulfide Minerals Under the Action of Different Gases. (In Russian.) I. N. Plaksin and S. V. Bessonov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), v. 61, Aug. 11, 1948, p. 865-868.

The above were investigated for gold, silver, copper, and their sulfides. Methods of investigation. Data indicate the selective action of oxygen on the mineral surfaces.

1C-8. Geology and Reserves of Lead and Zinc Ores: A World Survey. K. C. Dunham. *Nature,* v. 163, Jan. 1, 1949, p. 9-11.

Proceedings of Section F of the 18th session of the International Geological Congress, London (summer 1948). 35 papers on the above subject were presented.

1C-9. Uranium Deposits in the USSR. D. B. Shimkin. *Science,* v. 109, Jan. 21, 1949, p. 58-60.

Reviews available literature (mostly Russian) on the above. 28 ref.

1C-10. The Flotation of Copper Silicate From Silica. R. W. Ludt and C. C. DeWitt. *Mining Engineering* (Transactions Section), v. 1, Feb. 1949, p. 49-51.

An experimental study using synthetic mixtures. Alkali-substituted malachite-green dyes act as collectors for chrysocolla in synthetic silica-chrysocolla mixtures. Effects of amount of collector, method of addition, and presence of colloidal material. 14 ref.

1C-11. Flake-Graphite and Vanadium Investigation in Clay, Coosa, and Chilton Counties, Ala. Hugh D. Pallister and J. R. Thoenen. *Bureau of Mines.* Report of Investigations 4366, Dec. 1948, 84 pages.

Sampling data, and mining and milling methods. 53 ref.

1C-12. Mining and Milling Antimony Ore at Consolidated Murchison Goldfields, Transvaal. Ralph Symons. *Bulletin of the Institution of Mining and Metallurgy,* Jan. 1949, p. 1-36.

Topography, history, geology, prospecting, mining, surveying and sampling, assaying, surface transport, the ore-reduction process, power generation and distribution, compressed-air and water supply, labor, medical and social services, and costs. Crushing and sorting, milling, gold concentration, roasting of gold concentrate, treatment of calcine, antimony recovery, cyanidation of flotation tailings, and gold amalgamation and precipitation.

1C-13. Minerals for Chemical and Allied Industries. A Review of Sources, Uses and Specifications. Part XXVIII. Sydney J. Johnstone. *Industrial Chemist and Chemical Manufacturer,* v. 25, Jan. 1949, p. 9-16.

Uranium and radium, their ores, concentration methods, and uses. (To be continued.)

1C-14. (Book). **Strategic and Critical Minerals and Metals. Part 1. Manganese. Part 2. Chromite. Part 3. Copper. Part 4. Preliminary Review of the Problems of the Tungsten and Mercury Mining Industries. Part 5. Stockpiling.** 1541 pages and 22 charts. 1948. U. S. Government Printing Office. (Committee Hearing No. 38.)

Complete report of hearings before the Subcommittee on Mines and Mining of the Committee on Public Lands, House of Representatives, 80th U. S. Congress, 2nd Session. Consists of 4 volumes (Parts 4 and 5 combined).

2 SMELTING, REDUCTION and REFINING

2A—General

2A-3. Electrical Efficiency During Electrolysis of Fused Salts. (In Russian.) A. L. Rotinyan. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 21, July 1948, p. 755-764.

Proposes a new differential equation expressing the dependence of yield on current used, taking into consideration the influence of temperature and distance between electrodes. Experimental data from the literature confirm validity of the proposed equation. 10 ref.

2A-4. Problems in the Study of Ferrosilicon With High Silicon Contents. (In Russian.) A. A. Trots and M. S. Maksimenko. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 21, July 1948, p. 775-780.

A series of problems connected with the behavior of the above ferrosilicon during treatment were investigated; for instance: composi-

tion and amount of liberated gases, explosive characteristics, toxicity, etc.

2B—Ferrous

2B-18. Oxygen Speeds Production of Stainless Steels in the Electric Furnace. *Blast Furnace and Steel Plant,* v. 37, Jan. 1949, p. 62. Based on report by A. C. Ogan.

Experiences in Electric Furnace Dept., Duquesne Works, Carnegie Illinois Steel Corp.

2B-19. Review of Iron Sintering for 1948. E. W. Shallock. *Blast Furnace and Steel Plant,* v. 37, Jan. 1949, p. 65-66.

History of commercial sintering installations, not only for 1948, but since the first plant was built in 1906.

2B-20. Developments in Open Hearth Practice. Charles Fondersmith. *Blast Furnace and Steel Plant,* v. 37, Jan. 1949, p. 71-73.

Reviews 1948 developments.

2B-21. Progress in the Electric Furnace During the Year 1948. W. J. Reagan. *Blast Furnace and Steel Plant,* v. 37, Jan. 1949, p. 74-76.

Electric-furnace production of steel.

2B-22. The A.I.M.E.'s 1948 Electric Furnace Steel Conference. *Metal Progress,* v. 55, Jan. 1949, p. 52-54.

Reviews proceedings.

2B-23. Uses Oxygen Enriched Cupola Blast. *Iron Age,* v. 163, Jan. 27, 1949, p. 65. Based on recent article in *Pig Iron Rough Notes.*

2B-24. Distribution of Oxygen Between Metal and Basic Slag From the Point of View of Ionic Theory. (In Russian.) O. Esin and V. Kozheurov. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 21, July 1948, p. 765-774.

Analyzes the experimental data of Chipman and associates from the point of view of Timkin's theory of perfect ionic solutions. Coefficients of activity of ferrous oxide characterizing the deviation of the molten-slag behavior from that of an ideal ionic solution were determined. 10 ref.

2B-25. Production of Open Hearth Steel. L. F. Reinartz. *Steel,* v. 124, Jan. 17, 1949, p. 76, 78, 80, 82, 84, 87, 90, 92, 95; Jan. 24, 1949, p. 68, 70, 72, 75-76, 78, 80; Jan. 31, 1949, p. 82, 85-86, 88, 90-91; Feb. 7, 1949, p. 106, 109-110, 112, 115-116, 118; Feb. 14, 1949, p. 96, 98, 100, 102, 105-106.

Procedures and equipment. Part I emphasizes furnace design and refractories. Part II deals with handling of raw materials, charging equipment, and operating procedures. Types of scrap suitable, and sampling for carbon analysis. Part III deals mainly with handling equipment. Part IV describes differences in results obtained by the acid and basic processes. Photographs show ingot structures. Part V describes the cross-regenerative firing system used with today's furnaces. Detailed drawings of oil and natural-gas burners; a description of control systems; an organization chart for an eight-furnace open-hearth shop.

2B-26. Relation Between Chromium and Carbon in Chromium Steel Refining. D. C. Hilty. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 91-95.

Equilibrium constant and influence of temperature on it were derived for the iron-chromium-carbon-oxygen reaction in the practical range of chromium steel composition. Experimental setup and results.

2B-27. The Ionic Nature of Metallurgical Slags. Simple Oxide Systems. John Chipman and LoChing Chang. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 191-197.

Examines, in the light of ionic theory, recent data on slag-metal and slag-gas equilibria, in order to obtain a more complete or more satisfactory generalization than has been possible on the single basis of either simple compound formation or complete ionization. 17 ref.

2B-28. Jet Caster Speeds Tap Hole Opening. *Iron Age,* v. 163, Feb. 17, 1949, p. 85, 162. Based on paper by B. S. Old and A. R. Almeida.

New method for opening tap holes in blast furnaces, openhearths and other types of metallurgical furnaces, said to give promise of overcoming disadvantages of the oxygen lance. The device used is a capsule containing an insulated cone-shaped explosive charge.

2B-29. Quality Control in the Open Hearth. Part II: Control of Sulfur in Open Hearth Steel Making Process. Frank G. Norris. *Industrial Heating,* v. 16, Jan. 1949, p. 86, 88.

Sulfur content of the iron and coke; fuel used; factors affecting sulfur content; additions to the furnace; type of flame. (To be continued.)

2B-30. Sull'esistenza di un punto critico nell'affinazione dell'acciaio. (Existence of a Critical Point During the Refining of Steel.) Fausto Castagneri. *La Metallurgia Italiana,* v. 40, Nov.-Dec. 1948, p. 230-232.

A theoretical study. Existence of a critical point (minimum oxygen content) is indicated. See also *La Metallurgia Italiana,* May-June 1947; item 2b-177, 1948.

2B-31. Distribution of Oxygen and Sulfur Between Molten Iron and Basic Slags. (In Russian.) A. M. Samarin and L. A. Schvarsman. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk.* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Sept. 1948, p. 1457-1462.

On the basis of a theory, developed by Temkin, of the ionic nature of fused salts, the authors propose equations for determination of the above. Experimental data agree with the theory; however, agreement for distribution of oxygen is less close than for sulfur. Method of application of proposed equations.

2B-32. (Book). **Iron and Steel.** J. H. Chesters. 116 pages. Thomas Nelson and Sons Ltd., Parkside Works, Edinburgh 9, Scotland. 5s. net.

Production of iron and steel. Raw materials, methods of manufacture, and tests are described in language understandable to nonscientific readers. A brief historical review explains how the properties of the metals were first discovered, and gives an outline of the evolution of the various processes in use today.

2B-33. (Book). **Metallurgiya Chuguna. I. Vvedenie; Cyrye Materialy.** (Metallurgy of Cast Iron. I. Introduction; Raw Materials.) Ed. 3. M. A. Pavlov. 250 pages. 1948. Academy of Sciences of the USSR, Moscow and Leningrad.

Short review of methods used in the USSR and abroad, plus a comprehensive study of raw materials and their applicabilities to different production methods. World-wide resources of low and high-grade ores, fluxes and fuels used. Intended for research workers and advanced students. 109 ref.

2C—Nonferrous

2C-5. Non-Ferrous Metallurgy Shows advances. A. W. Schlechten. *Engineering and Mining Journal,* v. 150, Feb. 1949, p. 112-116.

New devolpments in production metallurgy.

2C-6. Development of the Modern Zinc Retort in the United States. H. R. Page and A. E. Lee, Jr. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 73-77.

Clay retort practice together with a description of major developments since 1912. 10 ref.

2C-7. Cadmium Recovery Practice in Lead Smelting. P. C. Feddersen and Harold E. Lee. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 110-117.

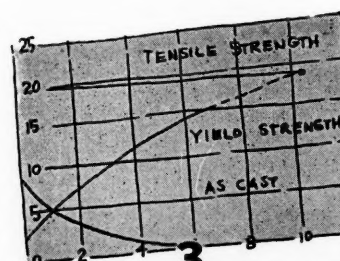
Procedures and equipment. Practice at major lead smelters throughout the world. Cadmium recovery at the mill of Bunker Hill and Sullivan Mining and Concentrating Co., Kellogg, Idaho. Market specifications for cadmium.

2D—Light Metals

2D-5. Mikroskopische Untersuchungen bei der Veredelung von Silumin. (Microscopic Investigations of the Refining of Silumin.) Elisabeth Schulz. *Zeitschrift fur Metallkunde,* v. 39, Apr. 1948, p. 123-128.

It was found possible to refine Silumin (a silicon-containing aluminum alloy) by use of sodium. Results showed that the solubility of Na in Al at the freezing temperature is about 0.003%, and that Mg additions reduce the required amount of Na as well as retard its loss.

For additional annotations indexed in other sections, see: 1C-5; 14B-18



3 PROPERTIES

3A—General

3A-17. Influence of Order on the Saturation Magnetic Moment. J. E. Goldman and R. Smoluchowski. *Physical Review,* ser. 2, v. 75, Jan. 15, 1949, p. 310-311.

In a previous paper the authors reported the influence of ordering on magnestostriction of Fe-Co alloys. From the theory which explained satisfactorily these results it followed that the saturation moment of the ordered alloy should be about 4% higher than in the random alloy. Experimental confirmation.

3A-18. Low-Temperature Properties. *Metal Progress,* v. 55, Jan. 1949, p. 82, 84, 86. Based on four articles entitled: "Mechanical Properties of Metals and Alloys in Tension at Low Temperatures," V. I. Kostenetz, *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 16, no. 5, 1946, p. 515-554.

The properties of several commercially pure metals, nonferrous structural alloys, carbon steels, alloy steels, and solders, all at +63, −321, and −424° F.

3A-19. Stress-Strain Rate Relations

for Anisotropic Plastic Flow. John E. Dorn. *Journal of Applied Physics,* v. 20, Jan. 1949, p. 15-20.

A simple theory for stress-strain rate analyses during plastic flow of anisotropic sheet metals is proposed for the workhardening range. The effect of orientation on yield strength in simple and biaxial tension is discussed for various types of symmetry. The theory appears to be approximately correct for mild steel plates that exhibit planar isotropy. 17 ref.

3A-20. Heat Transfer in Sweat-Cooled Porous Metals. Sidney Weinbaum and H. L. Wheeler, Jr. *Journal of Applied Physics,* v. 20, Jan. 1949, p. 113-122.

Formulas showing temperature distributions along the length of a sweat-cooled bar and across a sweat-cooled hollow cylinder are derived.

3A-21. The Theory of the Anomalous Skin Effect in Metals. G. E. H. Reuter and E. H. Sondheimer. *Proceedings of the Royal Society,* ser. A, v. 195, Dec. 22, 1948, p. 336-364.

See abstract of preliminary report from *Nature;* item 3a-41, 1948.

3A-22. A Metallurgical Investigation of Two Turbosupercharger Discs of 19-9DL Alloy. E. E. Reynolds, J. W. Freeman, and A. E. White. *National Advisory Committee for Aeronautics,* Technical Note No. 1535, Nov. 1948, 25 pages.

Results of tests to determine properties at room temperature and at 1200° F. of this material in forgings of the size used in service. Both discs were given hot-cold-working treatments at 1300 to 1350° F., but one was solution-treated and the other was left in the as-forged condition.

3A-23. Influence of Tensile Stress on Magnetization of Ferromagnetic Materials in the "Para Process" Region. (In Russian.) K. P. Belov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), v. 61, Aug. 11, 1948, p. 807-809.

The "para process" region is the region of magnetic saturation. The above was investigated for four specimens (Ni, 80% Ni + 20% Cu, 64% Fe + 36% Ni, and 44% Fe + 56% Pt) with heating and cooling. Data indicate that the influence of elastic deformation on the change of magnetic saturation is thermodynamically the opposite of the magnetostriction of the "para process."

3A-24. Concerning One Method in the Theory of Elastic and Plastic Deformation. (In Russian.) I. I. Gol'denblat. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), v. 61, Aug. 21, 1948, p. 1001-1004.

A mathematical analysis based on certain assumptions which permit application to finite deformations.

3A-25. The Behavior of the Elastic Moduli of Alignment of Alloy Structure Near the Curie Point. (In Russian.) L. Kholodenko. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 18, Sept. 1948, p. 812-817.

The above was investigated on the basis of the Landau theory of phase transformations of the second order. An expression is proposed relating the peaks of the temperature derivatives of elastic moduli with corresponding maxima for coefficients of thermal deformation and thermal capacity. A typical application of this formula to β-brass.

3A-26. Fluage et relaxation. (Creep and Relaxation.) Pierre Laurent and Michel Eudier. *Revue de Métallurgie,* v. 45, Oct. 1948, p. 415-418; discussion, p. 418.

Critically analyzes the Boltzmann formula relating theoretically the above phenomena. The discrepancy between theoretical and experimental data is explained on the basis of a proposed new theory. Experimental data for a commercial aluminum alloy containing 9.7% Cu.

3A-27. Investigation of Antifriction Properties of Cast Iron "Ts-1" and Bronzes "OF-10-1" and "OTsS-6-6-3." (In Russian.) Ya. V. Vodzinskii and D. M. Shvarts. *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Oct. 1948, p. 7-9.

Wear resistance was investigated using the Amsler testing machine under specific pressures of 28 and 40 kg. per sq. cm. for cast iron and 25 kg. per sq. cm. for the bronzes.

3A-28. Inwendige demping bij metalen. (Internal Friction in Metals.) H. C. den Daas. *Metalen,* v. 3, Dec. 1948, p. 73-77.

Reviews the various physical origins of internal friction, as far as they are known today. In general the sources of internal friction can be divided into two parts, diffusion effects and viscosity effects. 27 ref.

3A-29. Factors Responsible for Heat Stability of Heterogeneous Metallic Alloys. (In Russian.) K. A. Osipov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 62, Oct. 1, 1948, p. 493-495.

The above were investigated for a series of ternary and quaternary alloys. Besides melting points of the components, the main factors involved are structure and composition of the intermediate phase, and its dependence on temperature and residual stresses.

3A-30. Die Wirkung der Vormagnetisierung auf die komplexe Permeabilität von Spulenkernen. (The Effect of Premagnetization on the Complex Permeability of Coil Cores.) R. Feldtkeller and E. Stegmaier. *Frequenz,* v. 2, May 1948, p. 121-130.

A mathematical and graphically illustrated discussion on the laws governing the above for Si-Fe and Ni-Fe sheet.

3A-31. Studies on Fly Ash Erosion. M. A. Fisher and E. F. Davis. *American Society of Mechanical Engineers,* Paper No. 48-A-53, 1948, 18 pages.

Investigation of the erosion of metals by the impingement of fly ash.

3A-32. Some Measurements of Heat Flow Along Technical Materials in the Region 4° to 20° K. K. R. Wilkinson and J. Wilks. *Journal of Scientific Instruments and of Physics in Industry,* v. 26, Jan. 1949, p. 19-20.

Measurements were made along specimens of various materials placed with one end at temperatures varying from 14 to 20° K. and the other at a temperature of 4.2° K. Results are given for Ni-Ag, Cu-Ni, stainless steel, Cu, and glass. Thermal conductivities at temperatures of 10-20° are derived.

3A-33. The Creep of Glass at High Temperatures. C. Crussard. *Sheet Metal Industries,* v. 25, Dec. 1948, p. 2471-2474, 2484.

Creep curves for glass are compared with those for metals. Creep recovery is less pronounced in the case of metals, while for glasses the deformation is almost irreversible. Since the same form of curve is found for metals, plastics, and glasses, the reason for creep cannot be existence of a particular structure.

3A-34. The Effect of Internal Stresses on Hardness. Paul Blain. *Sheet Metal Industries,* v. 26, Jan. 1949, p. 135-136.

Experiments indicated that the surface hardness of steel, in the same condition of heat treatment, can vary in the ratio of 1 to 5 according to whether the metal is subject to stress or compression of the order of 165 kg. per sq. mm. in the region tested. This difference cannot be accurately measured by hardness tests using penetration methods. Instead, a nondestructive compression method was used.

3A-35. The Plastic, Creep and Relaxation Properties of Metals. A. E. Johnson. *Aircraft Engineering,* v. 21, Jan. 1949, p. 2-8, 13.

Experimental data on the departure from elastic behavior of a low-carbon steel in the range 20-550° C., and of an aluminum alloy in the range 20-200° C.; and of the creep properties under complex stresses of the low-carbon steel at 350° C., and of the aluminum alloy at 150-200° C. Details of methods and equipment, tables and graphs of data obtained, and mathematical analyses. 13 ref.

3A-36. The Physics of Sheet Steel. 25. The Probabilities of Cyclic Magnetisation. G. C. Richer. *Sheet Metal Industries,* v. 26, Jan. 1949, p. 75-80, 86; Feb. 1949, p. 309-314, 318.

First installment of section 25 includes introduction; the hysteresis loop; hysteresis loss; coercive force; residual induction; and the cyclic induction curve. Second installment deals with the mechanism of coercive induction; the mechanism of "springback" (residual induction); and cyclic discontinuities. (To be continued.)

3A-37. Methods of Determination of Deformability. (In Russian.) S. I. Gubkin. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Sept. 1948, p. 1463-1482.

Critically analyzes existing mathematical and physical theories of deformation of solid bodies. Proposes a theory using dimensionless numbers for deformations between +1 and −1. On the basis of this assumption, equations are proposed and graphically interpreted.

3A-38. (Book). **Traité de Plasticité pour l'Ingénieur.** (Treatise on Plasticity for Engineers.) Ed. 2. F. K. Th. van Iterson. 191 pages. 1947. H. Vaillant-Carmanne, S. A., 4, Place St. Michel, Liege, Belgium.

A theoretical approach to a series of problems connected with plasticity. Different modern theories are analyzed. A new theory of the plastic state is developed and confirmed by experiment and by theoretical analysis. 82 ref.

3A-39. (Book). **Essential Metallurgy for Engineers. Ed. 3.** Archibald Comley Vivian. Sir Isaac Pitman and Sons, Ltd., Parker St., Kingsway, London, W. C. 2, England. 12s 6d. net.

The relationship of metallurgy to engineering, and some stimulating criticisms of commonly held views concerning strength of materials, more especially, the physical properties of steel. A concise summary of the metallurgical properties of metals, of amorphous and crystalline structure, of the technique used by the metallurgist, of alloy steels, nonferrous metals and alloys, and of heat treatments. There is also a glossary of metallurgical terms. (From review in *Engineering.)*

3B—Ferrous

3B-13. Killed Bessemer—A New Steel of High Quality. E. G. Price. *Metal Progress,* v. 55, Jan. 1949, p. 39-42.

Commercial and economic condi-

tions that forecast a new lease on life for bessemer steel for the manufacture of products requiring fully killed ingots—products that heretofore have been made almost exclusively from openhearth or electric steel. Mechanical properties of the metal and of seamless tubing made from it.

3B-14. Additional Ferromagnetic Resonance Absorption Measurements on Supermalloy. W. A. Yager. *Physical Review,* ser. 2, v. 75, Jan. 15, 1949, p. 316-317.

Data are charted and compared with theory and with results previously reported.

3B-15. Contribution a l'étude des aciers faiblement alliés comportant des additions de titane pour pieces forgées résistant a chaud. (Contribution to the Study of Low-Alloy Steels With Titanium Additions for Forged Heat Resistant Structural Parts.) G. Delbart, R. Potaszkin, and A. Kohn. *Revue de Métallurgie,* v. 45, Oct. 1948, p. 374-385; discussion, p. 385-386.

Four types of low-alloy steels were investigated from the point of view of their heat stability, castability, and mechanical properties.

3B-16. Hochlegierte Stähle mit Stickstoffzusätzen. (High-Alloy Steels With Nitrogen Additions.) Hermann Schottky. *Zeitschrift fur Metallkunde,* v. 39, Apr. 1948, p. 120-122.

A brief report on the research done by German and Austrian steel mills since about 1935, discussing various types of alloys and their properties. The prime objective was to find methods of economizing nickel. The alloys developed were highly heat resistant as well as resistant to rust, acids, and scaling; the construction steels were nonmagnetic. 18 ref.

3B-17. Zusammenhang zwischen der Benetzung und dem elektrischen Uebergangswiderstand zwischen Eisen und Quecksilber. (Relation Between Wetting and Resistance to the Passage of Electricity Between Iron and Mercury.) E. Kobel. *Schweizer Archiv fur Angewandte Wissenschaft und Technik,* v. 14, Nov. 1948, p. 326-330.

Several methods of wetting iron that will reduce the electrical resistance between Fe and Hg to 1-3% of its original value.

3B-18. Magnetic Susceptibility of Austenitic Steel. (In Russian.) Z. A. Sviridova and G. V. Estulin. *Zhurnal Technicheskoi Fiziki* (Journal of Technical Physics), v. 18, Sept. 1948, p. 1207-1209.

Describes method. Determinations were made on a Cr-Mn-W steel (0.45% C, 14.4% Cr, 15.0% Mn, and 2.5% W).

3B-19. The Physics of Sheet Steel. 24. The Magnetisation Curve: Probability Analysis. G. C. Richer. *Sheet Metal Industries,* v. 25, July 1948, p. 1337-1343; Aug. 1948, p. 1550-1558; Sept. 1948, p. 1763-1768; Oct. 1948, p. 1965-1972, 1978; Dec. 1948, p. 2412-2414.

July issue: definitions and relationships; evaluation of Barkhausen dispersion index; the "middle straight"; parallelism; and trichotomy. Aug. issue: trichotomy vs. dichotomy; maximum permeability; skewness. Sept. issue: origin of skewness; ferromagnetic "overtones"; and group probabilities. Oct. issue: effects of structural disturbance and of recuperation in connection with group probabilities; "kinks" and "flats," and the "knee-point." Dec. issue: distribution of domain orientation; measurement problems. (To be continued.)

3B-20. The Fracture of Metals. C. F. Tipper. *Metallurgia,* v. 39, Jan. 1949, p. 133-137.

Fracture of mild steel is divided into three types: the first corresponds to parting along a shear plane; the second along two intersecting planes, giving a wedge-shaped fracture; and the third along a plane quite different from the shear plane, often at right angles to the tensile stress. The main conclusion is that fracture begins simultaneously at different locations, a fact confirmed by the work of Bridgman.

3B-21. Effect of Boron on the Hardenability of High-Purity Alloys and Commercial Steels. Thomas G. Digges, Carolyn R. Irish, and Nesbit L. Carwile. *Journal of Research of the National Bureau of Standards,* v. 41, Dec. 1948, p. 545-574.

Effectiveness of boron in enhancing hardenability of high-purity iron alloys varying in carbon content, and certain steels, is believed to be due to its action in retarding the rate of nucleation of ferrite and carbide while in solid solution in austenite. Hardenability of a commercial boron-treated steel, as determined by the end-quench test, was sensitive to prior thermal treatments, and carbon content. Heat treatment to produce a boron constituent and microstructures of the alloys as cast and as homogenized are described. 25 ref.

3B-22. 5 Ways That Diesels Wear: Mechanical Action; Scuffing or Welding; Surface Disintegration; Abrasive Action; Corrosive Action. *SAE Journal,* v. 57, Feb. 1949, p. 39-44; discussion, p. 41. Excerpts from "Piston Ring and Cylinder Wear in Diesel Engines" by John W. Pennington.

Several methods for combatting wear; emphasis on chromium plating, neutralization of fuel sulfur, and improved surface finishing.

3B-23. The Effect of Strain-Temperature History on the Flow and Fracture Characteristics of an Annealed Steel. E. J. Ripling and G. Sachs. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 78-90.

Results of experimental work on a low-carbon, 2.75% Si steel. Conclusions regarding the effect of straining a ferritic material at one temperature on fracture and flow characteristics at some other temperature. 11 ref.

3B-24. Ductile Cast Iron—A New Engineering Material. Albert P. Gagnebin, Keith D. Millis, and Norman B. Pilling. *Iron Age,* v. 163, Feb. 17, 1949, p. 76-84.

Material which combines the process advantages of cast iron with the product advantages of cast steel is characterized by a completely spheroidal graphite structure obtained by small additions of magnesium. Its properties, particularly high elastic modulus, high yield strength and high ductility, suggest suitability for many applications heretofore considered beyond the scope of cast iron.

3B-25. Influence de l'orientation sur la variation magnétique du module de Young dans une feuille d'invar monocristalline. (Influence of Orientation on the Magnetic Variation of Young's Modulus in a Sheet of Monocrystalline Invar.) Pierre-Jean Bouchet. *Comptes Rendus* (France), v. 227, Nov. 3, 1948, p. 904-906.

The elastic anisotropy of the above as obtained by recrystallization of a cold worked sheet was investigated on the basis of the force-elongation diagram. Data clearly indicate the existence of the above relationship.

3B-26. (Book). **Effects of Alloying Elements and the Tensile and Hardness Properties of Carbon and Alloy Steel.** 143 pages. 1948. Heppenstall Co., Pittsburgh.

A handbook of reference data.

3C—Nonferrous

3C-14. What Are Carbides Good For? R. D. Mack. *Western Machinery and Steel World,* v. 40, Jan. 1949, p. 82-85, 100.

Various standard carbide shapes made by Carboloy Co., and their properties and applications.

3C-15. Some New Aspects of the Strength of Alloys. G. M. Schwab. *Research,* v. 2, Jan. 1949, p. 47-48.

Results of a fundamental study of metal hardness at elevated temperature as related to several factors such as electrical resistance, electron concentration, activation energy of catalytic action, and activation energy of plastic deformation at low temperatures. In order to evaluate the latter for Hume-Rothery alloys, measurements were performed at temperatures up to 460° C. on the systems Cu-Zn, Cu-Sn, Ag-Zn, and Ag-Cd.

3C-16. Ferromagnetic Resonance Absorption in Heusler Alloy. W. A. Yager and F. R. Merritt. *Physical Review,* ser. 2, v. 75, Jan. 15, 1949, p. 318.

Data for the alloy of 26% Mn, 61% Cu, 13% Al. Calculation of "g factor". Results compared with those reported in the literature for other metals and alloys. 10 ref.

3C-17. Influence de la constitution physicochimique des alliages cuivre-zinc sur les propriétés élastiques. (Influence of the Physicochemical Constitution of Copper-Zinc Alloys on Elastic Properties.) Robert Cabarat, Léon Guillet, and René Le Roux. *Comptes Rendus* (France), v. 227, Oct. 4, 1948, p. 681-683.

Cabarat's apparatus, first described in 1943, in which cylindrical samples are subjected to high-frequency longitudinal vibrations, thus permitting tracing of the amplitude curve of the vibrations as a function of the frequency of excitation, was used to determine Young's modulus and internal friction of the above alloys containing up to 30% Zn as a function of their composition.

3C-18. Changes in Electrical Resistance and Thermoelectric Forces in Longitudinal Magnetic Fields in an Ni_3Mn Alloy as a Function of the Amount of Well-Oriented Phase. (In Russian.) R. G. Annaev. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), v. 61, Aug. 21, 1948, p. 1009-1012.

The above were investigated for 25 different samples of pure electrolytic Ni and Mn.

3C-19. Concerning Certain Peculiarities in the Superconductivity of Tantalum. (In Russian.) B. G. Lazarev and V. I. Khotkevich. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 18, Sept. 1948, p. 807-811.

Results of preliminary investigation indicate the high sensitivity of such properties of this metal to alterations of its lattice. The true critical parameter was obtainable only by use of a single-crystal specimen.

3C-20. Measurements at Low Temperatures and High Pressures. III. Superconductivity of Indium and Tin Under Multi-Directional Pressures of 1370 to 1730 Kg. per Sq. Cm. (In Russian.) L. S. Kan, B. G. Lazarev, and A. I. Sudovtsov. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theo-

retical Physics), v. 18, Sept. 1948, p. 825-832.

The above was investigated for polycrystalline indium and monocrystalline tin. It was found that displacements of the critical magnetic field decrease with decreasing temperature. Experimental methods and apparatus.

3C-21. Oscillograms of Disruption of Superconductivity by Audio-Frequency Currents. (In Russian.) A. A. Galkin and B. G. Lazarev. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 18, Sept. 1948, p. 833-836.

The maximum time necessary for transition of tin from the normal to the superconductive state, or conversely, was determined. Method of investigation and apparatus.

3C-22. Die elektrische Leitfähigkeit von mikrokristallinem hexagonalem Selen mit Thallium-Zusatz. (The Electrical Resistance of a Microcrystalline Hexagonal Selenium-Thallium Alloy.) Kurt Lehovec. *Zeitschrift fur Physik,* v. 124, Feb. 24, 1948, p. 278-285.

Investigates the d. c. resistance of hexagonal microcrystalline Se and its relationship to Th content and to previous treatment in the range from room temperature to the melting point. 10 ref.

3C-23. The Influence of Various Factors on the Creep of Lead Alloys. J. Neill Greenwood and J. H. Cole. *Metallurgia,* v. 39, Jan. 1949, p. 121-126.

Influence of steady stress at 20 and at 50° C. on lead-copper and lead-silver alloys. Influence of steady-stress vibration and previous heat treatment on alloys containing 0.075% Cu and 0.03% Ag, respectively.

3C-24. Cemented Carbides. Kenneth Rose. *Materials & Methods,* v. 29, Feb. 1949, p. 73-83.

Characteristics, properties, and uses of the various types. Attaching carbides to tools; grinding and polishing them; forming of the carbide pieces.

3C-25. Copper and Its Alloys. *Welding Journal,* v. 28, Feb. 1949, p. 161. Reprinted from *Tempil Topics,* v. 4, no. 1.

Properties compared with those of other common metals. Applications.

3C-26. Heat Capacities at Low Temperatures and Entropies of Vanadium Carbide and Vanadium Nitride. C. H. Shomate and K. K. Kelley. *Journal of the American Chemical Society,* v. 71, Jan. 1949, p. 314-315.

The above were measured from 50.4 to 298.16° K.

3C-27. High Temperature Heat Contents of Vanadium Carbide and Vanadium Nitride. E. G. King. *Journal of the American Chemical Society,* v. 71, Jan. 1949, p. 316-317.

The above were measured from about 400 to 1611° K. A table of heat content and entropy increments above 298.16° K. is presented, and heat-content and heat-capacity equations are derived.

3C-28. The Surface Tension of Solid Copper. H. Udin, A. J. Shaler, and John Wulff. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 186-190.

Rate and nature of flow of metal at temperatures approaching the melting point and under extremely low stresses. Importance in connection with powder metallurgy. 12 ref.

3C-29. The Effect of Alloy Additions on the Creep Strength of Zinc. F. Pawlek. *Sheet Metal Industries,* v. 26, Feb. 1949, p. 303-308, 318.

Development of test methods for the above; influence of various alloys on creep strength. Fe, Ni, Co, Cr, and Mn are most important. Their phase transformations and the properties of Zn-Fe sheet made from refined zinc.

3C-30. NACA and Office of Naval Research Metallurgical Investigation of Two Large Forged Discs of S-590 Alloy. J. W. Freeman and Howard C. Cross. *National Advisory Committee for Aeronautics,* Technical Note No. 1760, Feb. 1949, 63 pages.

Study of properties of above material at room temperature, 1200, 1350, and 1500° F. to determine the level of properties obtainable in forgings required for rotor discs of gas turbines. Results for tensile, impact, rupture, time-deformation, creep, and structural-stability tests. 11 ref.

3C-31. Office of Naval Research and NACA Metallurgical Investigation of a Large Forged Disc of S-816 Alloy. Howard C. Cross and J. W. Freeman. *National Advisory Committee for Aeronautics,* Technical Note No. 1765, Feb. 1949, 45 pages.

Properties of large discs of S-816 alloy for as-forged and aged condition and heat treated and aged condition determined by stress-rupture and creep tests for time periods up to 2000 hr. at room temperature, 1200, 1350, and 1500° F. Short-time tensile-test, impact-test, and time-deformation characteristics. 10 ref.

3C-32. Notiz zum Verhalten von Kupferblechen in Mercurosalzlösungen verschiedener Hg-Konzentration. (Note on the Behavior of Copper Sheets in Mercury-Salt Solutions of Different Mercurous-Ion Concentrations.) Friedrich Muller and Hellmut Reuther. *Zeitschrift fur Elektrochemie und Angewandte Physikalische Chemie,* v. 51, Jan. 1948, p. 44-45.

Study of photomicrographs indicates that none or a very limited amount of amalgam is deposited on sheets of copper immersed in very dilute solutions containing mercurous ions.

3C-33. Zur Oberflächenenergie fester Metalle. (The Surface Energy of Solid Metals.) R. Fricke. *Zeitschrift fur Elektrochemie und Angewandte Physikalische Chemie,* v. 52, Mar. 1948, p. 72-75.

A comparison of calculated surface energies of solid metals with experimentally determined surface stresses in the respective liquid metals. Data are tabulated for 13 nonferrous metals of three crystal types. 14 ref.

3D—Light Metals

3D-7. Advances in Magnesium Technology. *Light Metals,* v. 12, Jan. 1949, p. 24-28.

Recent developments indicate that future alloys are likely to contain more or less zirconium and cerium, together with trace quantities of beryllium.

3D-8. Age Hardening of Light Alloys. A. Guinier. *Research,* v. 2, Jan. 1949, p. 6-11.

Properties of light metals and alloys, physical investigations, solubility data, age-hardening theories, general features.

3D-9. High-Temperature Tensile Properties of Cast Aluminium-Silicon Alloys and Their Constitutional Significance. W. I. Pumphrey and P. H. Jennings. *Journal of the Institute of Metals,* v. 75, Dec. 1948, p. 203-233.

The above were determined during cooling from the liquid state and after rapid reheating of chill-cast alloys. Strength-temperature curves relating to both conditions were obtained for 10 alloys containing 0-12% Si. Effects of various factors on the form of the strength-temperature curve. 12 ref.

3D-10. A Consideration of the Nature of Brittleness at Temperatures Above the Solidus in Castings and Welds in Aluminium Alloys. W. I. Pumphrey and P. H. Jennings. *Journal of the Institute of Metals,* v. 75, Dec. 1948, p. 235-256.

A critical examination of the cause of cracking; it is concluded that it occurs in the brittle temperature range. Factors which affect the extent of the latter; the relationship between the cracking tendency and results of a test designed to observe such a tendency. Results of a mathematical study of conditions responsible for cracking in a butt weld between two parallel and restrained sheets of an aluminum alloy with wide freezing range and a small proportion of eutectic.

3D-11. A Consideration of the Nature of Brittleness at Temperatures Below the Solidus in Castings and Welds in Aluminium Alloys. W. I. Pumphrey and D. C. Moore. *Journal of the Institute of Metals,* v. 75, Dec. 1948, p. 257-267.

Occurrence of such cracking depends on ductility of the metal, on conditions of stress to which a cooling metal is subjected at subsolidus temperatures, and on the amount of cracking which occurs at temperatures above the solidus during cooling of the metal from the liquid state. The likelihood of subsolidus cracking in industrial conditions of casting and welding, and possible methods for its avoidance. 10 ref.

3D-12. Linearer Ausdehnungskoeffizient und elektrischer Widerstand von Aluminiumgusslegierungen mit Kupfer und Silizium. (Linear Expansion Coefficient and Electrical Resistance of Aluminum Cast Alloys Containing Copper and Silicon.) Franz Bollenrath and Viktor Hauk. *Zeitschrift fur Metallkunde,* v. 39, Apr. 1948, p. 106-108.

Experimental data and a constitution diagram. 15 ref.

3D-13. Röntgenographische Spannungsmessungen an Zugstäben aus Reinaluminium und aus einer Aluminium-Kupfer-Magnesium-Legierung bei plastischer Verformung. (X-Ray Stress Determination on Plastically Deformed Tensile Bars of Pure Aluminum and of an Aluminum-Copper-Magnesium Alloy.) Viktor Hauk. *Zeitschrift fur Metallkunde,* v. 39, April 1948, p. 108-110.

A brief factual description of the experiments and evaluation of the results.

3D-14. Contribution a l'étude du pouvoir thermoélectrique des métaux. (Contribution to the Study of the Thermoelectric Capacity of Metals.) C. Crussard and F. Aubertin. *Revue de Métallurgie,* v. 45, Oct. 1948, p. 402-410; discussion, p. 410.

The influence of structural changes induced by heat treatment, deformation, recrystallization, precipitation, etc., were investigated using Al-Cu, Al-Cu-Mg, and Al-Mg alloys. 13 ref.

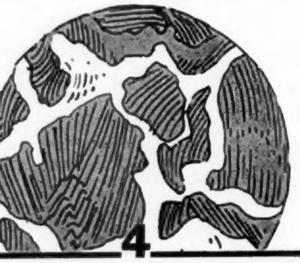
3D-15. Magnesium-Lithium Base Alloys—Preparation, Fabrication, and General Characteristics. J. H. Jackson, P. D. Frost, A. C. Loonam, L. W. Eastwood, and C. H. Lorig. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 149-168.

Experimental program conducted at Battelle Memorial Institute for Mathieson Chemical Corp. to determine whether addition of Li to Mg in sufficient quantities to change the crystal structure from hexagonal to body-centered cubic would result in improved cold-working characteristics and less anisotropy. Melting technique, fabricating prac-

tice, density measurements, mechanical properties, workhardening and stability characteristics, corrosion resistance, metallographic structure, information on effects of other elements.

For additional annotations indexed in other sections, see:

7B-31; 14D-9; 20D-6; 24A-21



4 CONSTITUTION and STRUCTURE

4A—General

4A-10. The Designation of Phases in Alloy Systems. Francis B. Foley. *Metal Progress,* v. 55, Jan. 1949, p. 59.

Recommends formation of international committee for standardization of the above.

4A-11. The Designation of Phases in Alloy Systems. Taylor Lyman. *Metal Progress,* v. 55, Jan. 1949, p. 62-64.

Referring to Francis B. Foley's suggestion (see above abstract), the secretary of the ASM Committee on Phase Diagrams and editor of Metals Handbook reviews some of the difficulties that have prevented a consistent nomenclature.

4A-12. Twin Crystal Inclusions in Aluminium and Iron. *Nature,* v. 163, Jan. 8, 1949, p. 62.

Hugh O'Neill points out in connection with a recent paper by W. May, T. J. Tiedema, and W. G. Burgers that he reported 20 years ago concerning ferrite crystals embedded in large recrystallized grains of iron, which were twins of the parent. (The latter authors described a similar phenomenon in aluminum.)

4A-13. Uber die Gefugeänderung von Kristalloberflächen durch Bearbeitung abhängig von der Härte. (The Effect of Hardness on the Structural Changes of Crystal Surfaces Caused by Working.) K. H. Leise. *Zeitschrift fur Physik,* v. 124, Feb. 24, 1948, p. 258-263.

Disproves Beilby's theory of a liquid-like surface film caused by mechanical working (such as polishing).

4A-14. Unit Cell Dimension of Face-Centered Cubic Chromium Hydride and Space Groups of Two Chromium Hydrides. Clovd A. Snavely and Dale A. Vaughan. *Journal of the American Chemical Society,* v. 71, Jan. 1949, p. 313-314.

A new value of 3.8605±0.0005 A. for the lattice parameter of F.C.C. chromium hydride is reported. Structures are postulated for the F.C.C. and H.C.P. chromium hydrides. Argument is presented to refute the concept that chromium is allotropic.

4A-15. The Effect of Orientation Difference on Grain Boundary Energies. C. G. Dunn and F. Lionetti. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 125-132.

Eleven flat specimens of silicon ferrite each composed of three grains were prepared having (110) planes in the plane of the samples. Each sample was annealed at 1300-1400° C. until further change in grain boundaries seemed unlikely and equilibrium angles apparently had been obtained. Grain boundary angles were measured and relative surface tensions calculated. A curve was obtained showing variation of relative energy in the grain boundary per unit area with difference in crystal orientation.

4A-16. Solid Nuclei in Liquid Metals. Cyril Stanley Smith. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 204.

Theory which postulates that every crystal, containing minute amounts of any of a wide range of impurities, automatically engenders particles having the correct surface structure to serve as nuclei for subsequent solidification. This theory is said to be applicable to any system: metallic, organic, or inorganic.

4A-17. Elektrische Uberfuhrungsmessungen zur Untersuchung der Heteropolarität fester intermetallischer Phasen. (Electrical Transfer Measurements for Investigation of the Heteropolarity of Solid Intermetallic Phases.) O. Kubaschewski and K. Reinartz. *Zeitschrift fur Elektrochemie und Angewandte Physikalische Chemie,* v. 52, Mar. 1948, p. 75-86.

In earlier experiments it was discovered that in alloys not only the electrons but also the atom cores or ions participate in the transfer of electric currents. Experiments were made using Mg-Bi alloys in order to expand the theory of "transfer number" to phases with partial metallic conductivity. The part played by the electron gas in the conduction of electric current. 15 ref.

4B—Ferrous

4B-7. Precision Measurement of Crystal-Lattice Parameters. D. E. Thomas. *Journal of Scientific Instruments and of Physics in Industry,* v. 25, Dec. 1948, p. 440-444.

Technique and effect of errors due to inaccurate measurement, penetration of the specimen, and divergence of the incident beam. Figures are given for the lattice parameter of iron.

4B-8. Belgian Research Advances Nodular Graphite Theory. Albert De Sy. *American Foundryman,* v. 15, Jan. 1949, p. 55-62.

1948 Exchange Paper of Belgian Foundrymen's Association to the French Foundrymen's Association advances the hypothesis that the crystal system of the nuclei or solid particles suspended in molten gray iron determines whether nodular graphite or flake graphite will be precipitated. Includes phase diagrams and photomicrographs.

4B-9. Certain Peculiarities of the Initial Stages of the Dissociation of the ϵ-Solid Solution in the Iron-Nitrogen System. (In Russian.) A. M. Elistratov. *Zhurnal Technicheskoi Fiziki* (Journal of Technical Physics), v. 18, Sept. 1948, p. 1173-1178.

The effect of irregular diffusion of the Debye lines of the epsilon phase in the Fe-N system was investigated, establishing its relationship with dissociation of the supersaturated solution to a mixture of epsilon plus gamma phases. Proposes a theory explaining this phenomenon and compares results so obtained with experimental data.

4B-10. L'allotropie du fer et celle de l'helium. (The Allotropy of Iron and That of Helium.) Carl Benedicks. *Revue de Métallurgie,* v. 45, Oct. 1948, p. 397-401.

The above was investigated for iron in the range 770-900° C. and for helium between 16 and 2.4° K. Fundamental similarities and differences of the two phenomena; a general mechanism for allotropy.

4B-11. Graphitisation in the Malleable Process. H. G. Hall. *Foundry Trade Journal,* v. 86, Jan. 20, 1949, p. 55-57. A condensation.

Fundamental reactions, the role of iron sulfide, factors affecting graphitization rate, effects of alloying and residual elements, and effects of raw materials. Application to production of malleable iron.

4B-12. A Description of Some Defects in Steel and Means for Their Detection. H. Thompson. *Sheet Metal Industries,* v. 25, Sept. 1948, p. 1751-1756.

The solidification process, typical types of defects, and methods for their detection. 10 ref.

4B-13. The Modifications of the Carbide, Fe_2C; Their Properties and Identification. L. J. E. Hofer, E. M. Cohn, and W. C. Peebles. *Journal of the American Chemical Society,* v. 71, Jan. 1949, p. 189-195.

The relationship between Fe_2C carbides reported in thermomagnetic studies and those reported in X-ray diffraction studies. New results obtained with iron catalysts make possible a general unification of literature data. 20 ref.

4B-14. Homogeneous Yielding of Carburized and Nitrided Single Iron Crystals. A. N. Holden and J. H. Hollomon. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 179-185.

Method for preparation of the crystals and for their carburization, nitriding, and yield testing. Carbon or nitrogen causes discontinuous yielding in iron polycrystals but does not appear to cause discontinuous yielding in iron single crystals made from aluminum-killed steels. Both elements in small amounts cause an increase in the flow strengths of single crystals, but do not affect the rate of strain hardening. 10 ref.

4C—Nonferrous

4C-11. The Structure of Extremely Thin Layers Evaporated in Kinetic Vacuum Systems. H. A. Stahl. *Journal of Applied Physics,* v. 20, Jan. 1949, p. 1-8.

In a commercial electron-diffraction camera some alkaline earth metals were evaporated onto outgassed metal sheets or glass slides. The diffraction patterns of the thinnest layers (to about 10^3A) presented exclusively the patterns of the respective oxides. The pattern of the metal space lattice itself was increasingly observed with Be, Al, Ni, and Mo only after uninterrupted evaporation to layer thicknesses of about 1μ. When Mg, Ca, and Sr were evaporated, no patterns without very intensive oxide rings could be attained under the conditions used. 15 ref.

4C-12. The Thermal Behavior of Evaporated Layers in Vacuum Devices. H. A. Stahl. *Journal of Applied Physics,* v. 20, Jan. 1949, p. 8-14.

Some layers having the space lattice pattern of the metal (Be, Mg, Al, Mo, or Ni) were heated for constant periods. Beginning with a distinctly marked threshold temperature, interference rings of the oxide space lattice appeared while, simultaneously, the metal space-lattice pattern diminished, entirely disappearing at another higher temperature. The oxidation tempera-

ture ranges of Be, Mg, and Al were measured. An elementary calculation gives a lower time limit to oxidation of the observable surface layer. The surface layer of polished metals is considered. 28 ref.

4C-13. The Internal Friction of Zinc Single Crystals. Charles A. Wert. *Journal of Applied Physics,* v. 20, Jan. 1949, p. 29-37.

Typical data for 12 single crystals of zinc oscillating longitudinally. Zinc of three grades of purity was used. The behavior of decrement as a function of stress-amplitude was found to depend less on purity of the metal than has been reported previously. Effects of cold-work and annealing variations.

4C-14. The Deformation and Recrystallization of an Alloy Containing Two Phases. R. W. K. Honeycombe and W. Boas. *Australian Journal of Scientific Research,* ser. A, v. 1, no. 1, 1948, p. 70-84. (Reprint.)

An investigation on the above for an alloy of duplex brass containing 60% Cu and 40% Zn using microscopic and X-ray methods.

4C-15. Variation With Temperature of the Nucleation Rate of Supercooled Liquid Tin and Water Drops. Bernard Vonnegut. *Journal of Colloid Science,* v. 3, Dec. 1948, p. 563-569.

X-ray diffraction, dilatometric, and visual techniques for measuring the extent of crystallization of systems composed of many small mutually independent volumes of supercooled liquid. Results of preliminary measurements on supercooled liquid tin and supercooled water.

4C-16. Distribution of Electron Density in the Metallic Copper Lattice. (In Russian.) V. K. Kritskaya and B. M. Rovinskii. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 18, Sept. 1948, p. 785-789.

Possibility of applying Fourier series for quantitatively obtaining the above. Curves were obtained for three directions in metallic copper. It is shown that "computed temperature," introduced as a factor in the equation, may lead to considerable error in the final result.

4C-17. The Crystal Structure of CdSb and ZnSb. (In English.) Karl Erik Almin. *Acta Chemica Scandinavica,* v. 2, nos. 5-6, 1948, p. 400-407.

Lattice dimensions and structures were determined from powder and Weissenberg photographs.

4C-18. Uber die Struktur mechanisch bearbeiteter Oberflächen und deren Eigenschaften. (Zur Frage der sog. Beilby-Schicht.) (Concerning the Structures and Properties of Mechanically Worked Surfaces. The Question of the So-Called Beilby Layer.). H. Raether. *Zeitschrift fur Physik,* v. 124, Feb. 24, 1948, p. 286-308.

Investigations by electron-diffraction techniques. Interference pictures show the worked surfaces of silver and of inorganic insulating materials. Differences in behavior of metals and nonmetals on cold working. 59 ref.

4C-19. Beziehungen zwischen dem Elastizitätsmodul von Zweistofflegierungen und ihrem Aufbau. (Relationships Between Moduli of Elasticity and Structures of Binary Alloys.) Werner Köster and Walter Rauscher. *Zeitschrift fur Metallkunde,* v. 39, April 1948, p. 111-120.

A comprehensive survey covering a variety of nonferrous continuous and limited solid-solution series, eutectic alloys, and alloys with intermetallic phases. 27 ref.

4C-20. Etude de la formation de l'ordre dans les solutions solides Or-Cuivre Au-Cu_3. (Study of the Disorder-Order Transformation in the Gold-Copper Solid Solution $AuCu_3$.) A. Guinier and R. Griffoul. *Revue de Métallurgie,* v. 45, Oct. 1948, p. 387-396.

X-ray investigation in an attempt to explain the mechanism of the above type of transformations after heat treatment. 16 ref.

4C-21. Electronographic Study of Thin Films of Alloys of the Cu-Sn System. (In Russian.) G. A. Efendiev. *Zhurnal Technicheskoi Fiziki* (Journal of Technical Physics), v. 18, Sept. 1948, p. 1159-1165.

Electronographic study of the alloy structure of the Cu-Sn system on film specimens obtained by vacuum deposition. Formation of delta, epsilon, and eta phases was shown to take place.

4C-22. Plasticity of Intermetallic Phases. (In Russian.) E. M. Savitskii. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 62, Sept. 21, 1948, p. 349-351.

The characteristic properties of pure intermetallic phases were investigated for MgZn, $MgZn_2$, and $MgZn_5$ (more exactly, Mg_2Zn_{11}). Intermetallic phases, being very brittle at room temperature, show a marked increase of plasticity when heated. Because of the scarcity of existing data concerning the crystal structure at high temperatures, no definite conclusions concerning the mechanism of the temperature influence on plasticity were reached.

4C-23. Solubility Relationships of the Refractory Monocarbides. John T. Norton and A. L. Mowry. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 133-136.

Mixtures of monocarbides of Ti, Zr, V, Cb, and Ta were sintered in a conventional high-frequency vacuum furnace at 2100° C. for 3 hr. Equilibrium was judged by the appearance of the X-ray diffraction lines. Lattice constants were calculated from X-ray data.

4C-24. Properties of Chromium Boride and Sintered Chromium Boride. S. J. Sindeband. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 198-202.

Only one chromium boride exists between 12 and 20% B, instead of two, as previously reported. This compound is said to be CrB. Structure, unit-cell dimensions, and coordinates. The pressing and sintering of CrB with a Ni binder, mechanical properties, and high-temperature strength and corrosion resistance. 13 ref.

4C-25. Grain Coarsening in Copper. Paul A. Beck, John Towers, Jr., and Philip R. Sperry. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 203-204.

Coarsening at 800° C., after 30-70% reduction by rolling, may develop in straight-rolled as well as in cross-rolled tough-pitch copper. This confirms the view that coarsening in Cu_2O-containing copper after 30-70% rolling is analogous to coarsening in aluminum containing dispersed particles of a second phase.

4C-26. Experimental Investigation of Electron Density in Crystals. III. Electron Density of Nickel. (In Russian.) N. V. Ageev and L. N. Guseva. *Izvestiya Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Chemical Sciences), Sept.-Oct. 1948, p. 470-478.

Calculation of the distribution of electron densities for six directive elementary nuclei of nickel was performed by the method of the triple Fourier series at 8000° C. 15 ref.

4D—Light Metals

4D-10. Grain Refinement in Cast Aluminum. Vincent DePierre and Harold Bernstein. *Iron Age,* v. 163, Jan. 20, 1949, p. 66-70.

The influence of various elements upon crystallization characteristics. Effects of elements reported to be grain refiners, those which form commercial alloys, and those classed as impurities in commercial aluminum.

4D-11. The Recovery and Recrystallization of Rolled Aluminium of Commercial Purity. P. C. Varley. *Journal of the Institute of Metals,* v. 75, Dec. 1948, p. 185-202.

A study was made, by means of ultimate tensile strength determinations, of the above process within the range 200-325° C. The observations are consistent with the theory that both recovery and recrystallization take place by the diffusion of dislocations in the lattice and the mutual annihilation of those of opposite sign.

4D-12. Experiments on the Possibility of Hardening the Alpha Solid Solution of Selected Binary Magnesium Alloys by the Addition of 1% of Rare Earth Metals. H. T. Hall. *Magnesium Review and Abstracts,* v. 8, Jan. 1948, p. 3-28.

Structures and properties of alloys obtained by addition of 1% rare-earth metals to the following magnesium alloys: 8% Al; 6% Sn; 6% Ag; 6% Zn + 0.4% Mn; and 4% Zn + 0.4% Mn. The effects of increased rare-earth contents, silver additions, and various heat treatments were determined and sagging tests at elevated temperatures were carried out. Solution and fully heat treated properties of Mg + 8% Cd + 1% rare-earth; and 3% Zn + 2% Cd + 1% rare-earth alloys also were determined.

4D-13. Uber den Einfluss pendelnder Gluhtemperaturen auf Einformungs- und Diffusionsvorgänge in Aluminium-Legierungen. (The Effect of Fluctuating Annealing Temperatures on the Shape and Diffusion of Inclusions in Aluminum Alloys.) H. Kostron. *Metall,* June 1948, p. 179-185.

Proposes a theory to explain the fact that diffused metal (for instance, silicon) segregates in the form of bars, scales, or needles rather than as spheres or spheroids. Photomicrographs show the inclusions in Al-Cu-Mg alloys. 12 ref.

4D-14. Evolution structurale des alliages trempés Aluminium-Cuivre 4% et la réversion. (Structural changes of an Annealed 4% Copper Aluminum Alloy and Its Reversibility.) Adrian Saulnier. *Revue le l'Aluminium,* v. 25, Dec. 1948, p. 369-373.

It was found that recrystallization takes place after the end of the structural-hardening stage, resulting in a secondary increase of hardness.

4D-15. Uber die Weiterentwicklung von Magnesiumlegierungen. (The Further Development of Magnesium Alloys.) Gustav Siebel. *Zeitschrift fur Metallkunde,* v. 39, April 1948, p. 97-105.

The effect of Be on the oxidizability of molten Mg alloys; the grain-refining effect of Zr and Ce on cast and forged materials; and the effect of chlorine as well as organic and inorganic chlorine and carbon compounds on the grain size of cast Mg-Al and Mg-Zn alloys.

4D-16. Preferred Orientation in Rolled and Recrystallized Beryllium. A. Smigelskas and C. S. Barrett. *Journal of*

Metals, v. 1, sec. 3, Feb. 1949, p. 145-148.

X-ray pole figures were determined for samples rolled at room and at elevated temperatures. Typical series included exposures with the beam normal to the rolling direction and at 11, 26, 41, 56, and 71° to the cross direction, plus two exposures with the beam normal to the cross direction, and at 11 and 79° respectively to the rolling direction.

For additional annotations indexed in other sections, see:

3A-19-29-39; 3B-25; 3C-18-19; 3D-8-12-13-15; 5C-3; 12-26; 14B-16; 19A-21

5A—General

5A-7. Powder Metallurgy. Wallace W. Beaver. *Metals Review,* v. 22, Jan. 1949, p. 5-8.

A review based on the technical literature for 1947-48. References to "ASM Review of Current Metal Literature."

5A-8. Powder Metallurgy in 1948. R. A. Hetzig. *Chemical Age,* v. 60, Jan 8, 1949, p. 68-71.

A review. 36 ref.

5A-9. Relationship of Shrinkage and Properties of Powder Compacts to Their Density (Porosity). (In Russian.) M. Yu. Bal'shin. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 18, Sept. 1948, p. 1179-1184.

An elaboration of earlier studies on mechanism governing relationship between shrinkage and density. Powders used in study were Cu, Cu + graphite; Cu + Sn; Fe; and Fe + Cu.

5A-10. Pressure Distribution in Compacting Metal Powders. Pol Duwez and Leo Zwell. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 137-144.

Pressure at various points on the bottom and sides of a die 1.50 in. in diameter was measured by means of small piston dynamometers and resistance-sensitive strain gages. Pressure distribution inside the compact was also determined by an indirect method based on density measurements.

5A-11. Self-Diffusion in Sintering of Metallic Particles. G. C. Kuczynski. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 169-178.

The radius of the interface formed during bonding in simple systems composed of spherical particles and large blocks of Ag and Cu was studied as a function of time and temperature. It is believed that the mechanism involved is fundamental to sintering operations. The mechanism is predominantly that of volume diffusion for large particles and higher temperatures. At the beginning of sintering, surface diffusion is operative. The surface-diffusion coefficient of Cu was determined. 14 ref.

5A-12. Air Grading of Sub-Sieve Powders. *Industrial Diamond Review,* v. 9, Jan. 1948, p. 19-22. Based on "Particle-Size Analysis of Metal Powders," Metals Disintegrating Co., Elizabeth, N. J.

The Roller Air Analyzer and results obtained with the Fisher Sub-Sieve Sizer.

5B—Ferrous

5B-2. Alloy Steels; Production by Powder Metallurgy. H. W. Greenwood. *Iron and Steel,* v. 22, Jan. 1949, p. 9-10.

What has been done in this field and advantages over conventional methods.

5B-3. Elektrolytisk framställning av järnpulver. (Production of Electrolytic Iron Powder.) Gösta Wranglen. *Jernkontorets Annaler,* v. 132, no. 12, 1948, p. 501-516.

Electrolytic metal powders can be produced either by direct deposition at the cathode or by grinding of a coherent deposit. In the case of iron the latter method is the simplest and cheapest. Conditions of electrolysis in each case. Influence of structure of the deposited iron on shape of the powder particles. The fibrous structure of the normal deposit gives long needlelike particles after grinding which are undesirable for sintering. Three methods are proposed for modifying this structure. Industrial applications, particularly the anode material and the anode process which has been successfully applied by two small plants in Sweden. 23 ref.

5B-4. Diffusion in Iron-Silicon Compacts. F. W. Glaser. *Powder Metallurgy Bulletin,* v. 4, Jan. 1949, p. 19-22.

Object of the work was to follow the progress of bonding and diffusion during the sintering of Fe-Si compacts. Electrical-resistivity measurements were used. Three series of specimens were prepared: cold pressed and sintered; hot pressed and annealed; and prealloyed, crushed to −100 mesh, and hot pressed.

5C—Nonferrous

5C-2. Porous Metal in the Chemical Industry; Applications for Filtration, Aeration and Other Purposes. J. W. Lennox and G. Brewer. *Industrial Chemist and Chemical Manufacturer,* v. 25, Jan. 1949, p. 31-35.

Experiments with regular-shaped bronze particles, as well as applications.

5C-3. Tungsten Carbide-Free Hard Metals. R. Kieffer and F. Kolbl. *Powder Metallurgy Bulletin,* v. 4, Jan. 1949, p. 4-17.

Possibility of developing the above; properties and structures of various hard materials which were considered as substitutes for WC. The superiority of solid solutions of two or more carbides over single-carbide systems is indicated. It is concluded that hard alloys containing no metal carbides are of limited value; but that WC can be replaced by metal carbides of the 4th, 5th, and 6th groups of the periodic system. TiC appears to be most suitable as a major constituent; and VC, CbC, and MoC as minor ones. Methods of production.

5C-4. Manufacture of Ductile Thorium. W. Espe. *Powder Metallurgy Bulletin,* v. 4, Jan. 1949, p. 17-18.

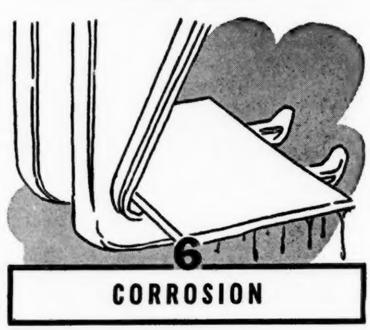
Production methods developed during the war in Germany. Powder-metallurgy techniques were exclusively employed.

5C-5. The Densification of Copper Powder Compacts in Hydrogen and in Vacuum. Charles B. Jordan and Pol Duwez. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 96-99.

Changes of density were studied as a function of temperature and time of sintering. Results are graphed and correlated mathematically.

For additional annotations indexed in other sections, see:

3C-28; 10A-35



6A—General

6A-15. A Unified Mechanism of Passivity and Inhibition. R. B. Mears. *Journal of the Electrochemical Society,* v. 95, Jan. 1949, p. 1-10.

A mechanism based on the behavior of local elements in metal surfaces is developed. Passivity may be achieved either by reduction of open-circuit potential differences between local anodes and cathodes, increased anodic polarization, increased cathodic polarization, or a combination of these factors. 19 ref.

6A-16. Corrosion and Incrustation of Well Screens. G. F. Briggs. *Journal, American Water Works Association,* v. 41, Jan. 1949, p. 67-74.

Definitions; forms of corrosion; conditions favorable to corrosion; anti-corrosion measures; forms and causes of incrustation; overcoming incrustation.

6A-17. Hydrochloric Acid Versus Construction Materials. *Chemical Engineering,* v. 56, Jan. 1949, p. 231-232, 234, 236, 238, 240.

Part II of a symposium. Includes "Carbon and Graphite," W. M. Gaylord; "Tantalum," Leonard R. Scribner; "Chlorimet," Walter A. Luce; "Iron and Steel," A. W. Spitz; and "Worthite," W. E. Pratt.

6A-18. An Investigation into the Corrosion of Zinc and Zinc-Coated Steel in Hot Waters. P. T. Gilbert. *Sheet Metal Industries,* v. 25, Oct. 1948, p. 2003-2012; Nov. 1948, p. 2243-2254; Dec. 1948, p. 2441-2448, 2460.

At temperatures up to 85° C., corrosion is usually more highly localized in hot water than in cold. Experimental work was undertaken in an attempt to confirm the theory that the usual electrochemical relationship between zinc and steel is reversed in hot water and to determine the conditions under which this occurs. A theory of the phenomenon is formulated. 24 ref.

6A-19. The Use of Inhibitors for Controlling Metal Corrosion. Part II. Types of Inhibitors. G. T. Colegate. *Metallurgia,* v. 39, Jan. 1949, p. 149-151.

Use of inhibitors in aqueous media for preventing galvanic action between dissimilar metals in contact.

6A-20. Galvanic Corrosion and Its

Practical Significance. G. T. Colegate. *Metal Treatment and Drop Forging,* v. 15, Winter 1948-9, p. 183-192.

The fundamentals of corrosion. Conclusions are applied to practical conditions with special reference to Cu, Al, Fe, and Mg alloys. Methods of corrosion prevention. 15 ref.

6A-21. Apercu succinct. Des expériences atmosphériques de longue durée de la Commission suédoise de Corrosion. (A Brief Report. Long-Time Atmospheric Tests Performed by Swedish Commission on Corrosion.) Eva Palmaer. *Métaux & Corrosion,* v. 23, Dec. 1948, p. 285-290.

Method used and results obtained. Emphasis on testing of specimens coated or treated with anticorrosive agents. Influence of different factors involved.

6A-22. Stress-Corrosion: A Review of the Literature. K. R. Hanna. *Division of Aeronautics, Council for Scientific and Industrial Research, Commonwealth of Australia* (Melbourne), Report SM. 120, Oct. 1948, 19 pages.

Nature of stresses, effects of stress on electrode potentials of metals, alloy characteristics influencing stress-corrosion, methods of preventing or minimizing stress-corrosion, and methods of testing.

6B—Ferrous

6B-21. Electron Diffraction Studies on the Nature of the Corrosion Resistance of Stainless Steel. On the Ferrous Nickel Chromate Formed on the Surface of Stainless Steel. Shigeto Yamaguchi, Tadayuki Nakayama, and Tominosuke Katsurai. *Journal of the Electrochemical Society,* v. 95, Jan. 1949, p. 21-24.

Electron diffraction measurements were made of surface films produced on 18% Cr, 4% Ni; and 19% Cr, 9% Ni stainless steels. The films were formed by exposing the metals to water vapor at elevated temperatures and pressures in an autoclave. Comparison with X-ray diffraction data indicate that the film may be a solid solution of $(Ni, Fe)CrO_4$.

6B-22. Sulphate-Reducing Bacteria and Internal Corrosion of Ferrous Pipes Conveying Water. K. R. Butlin, Mary E. Adams, and Margaret Thomas. *Nature,* v. 163, Jan. 1, 1949, p. 26-27.

Examination of "tubercles" on the inside of water mains shortly after removal from the soil disclosed presence of sulfide sulfur, elementary sulfur, severe graphitization of the cast iron underneath the "tubercles," and comparatively large numbers of sulfate-reducing bacteria. Conditions were roughly comparable to those obtained in anaerobic microbiological corrosion of ferrous-pipe exteriors.

6B-23. Causes and Prevention of Drill Pipe and Tool Joint Troubles. Part IV. Drill Pipe. Part V. Tool Joints. H. G. Texter, R. S. Grant, and S. C. Moore. *World Oil,* v. 128. Jan. 1949, p. 90, 92, 96, 100, 102; discussion, p. 102, 104; Feb. 1, 1949, p. 96-97, 100-102, 104.

Part IV deals with troubles due to worn pipe, crooked pipe, collapsed pipe, eccentric-wall pipe, internal erosion, and magnetism. Part V describes various types of mecanical difficulties with tube joints, such as longitudinal splitting, galled or frozen threads, and wabble failures. 17 ref. (To be concluded.)

6B-24. Pipe Line Corrosion Control With Cathodic Protection. K. D. Wahlquist. *World Oil,* v. 128, Feb. 1, 1949, p. 163-164, 166, 168, 170.

Recommended practices.

6B-25. Corrosion Fatigue of Steel Under Asymmetric Stress in Sea Water. A. J. Gould. *Journal of the Iron and Steel Institute,* v. 161, Jan. 1949, p. 11-16.

Severity of corrosion-fatigue in sea water under reversed stress with superimposed tensile stress was found to be almost independent of mean stress, provided it is not excessive. This result was obtained on polished specimens, scale-covered specimens, and specimens descaled by pickling.

6B-26. Weather Resistance of Porcelain Enamels Exposed for Seven Years. William N. Harrison and Dwight G. Moore. *Journal of the American Ceramic Society,* v. 32, Jan. 1, 1949, p. 15-25.

A study begun at the National Bureau of Standards in 1939 involved 864 1-ft. square panels and an equal number of 4 x 6-in. laboratory specimens. Panels were exposed in Washington, D. C., St. Louis, Lakeland, Fla., and Atlantic City, N. J. Results showed good correlation between acid resistance and resistance to weathering. When initial coverage was complete and no mechanical damage had occurred, protection was unimpaired. Colored enamels faded only on panels having poor acid resistance. 13 ref.

6B-27. Angriff von Eisen in technischen Schwefelsäuren und Nitrosen. (Corrosion of Iron in Commercial Sulfuric Acids and Nitrosylsulfuric Acid Solutions.) Franz Perktold. *Angewandte Chemie,* ser. B, v. 20, May-June 1948, p. 125-128.

Experiments made to determine the effect of temperature, density, and nitrosylsulfuric acid content on the resistance of different types of iron to corrosion, with the object of replacing the lead linings of sulfuric acid vessels by iron. 16 ref.

6B-28. Uber die Korrosionsverhältnisse in den Auspuffleitungen von Verbrennungsmotoren. (Corrosion of the Exhaust Pipes of Internal-Combustion Engines.) Gerhard Schikorr. *Metalloberfläche,* v. 2, April 1948, p. 73-79.

Apparatus for quantitative determination of the corrosiveness of exhaust gases on metal at about 70, 180, and 400° C. Results for cast iron and copper. 25 ref.

6B-29. Korrosionserfahrungen an Stahlrohren aus Kalt- und Warmwasserleitungen und aus Kesseln. (Corrosion Experiences on Cold and Hot Water Pipes and Boilers.) W. M. Muller. *Archiv fur Metallkunde,* v. 1, Nov.-Dec. 1947, p. 480-487.

A general discussion, based in part on the examination of samples taken from water lines after various service periods, and in part on laboratory experimentation. The difficulties of welding corroded metal. 11 ref.

6B-30. Corrosion Inhibition With Chromate. 1. Introduction and General Data. 2. Drilling—Oil Production—Gas Condensate. 3. Gas Processing Plants and Refineries. 4. Corrosion Problems in Pipe-Line Systems. Tankers, Petroleum Distribution Equipment. Marc Darrin. *Oil and Gas Journal,* v. 47, Jan. 13, 1949, p. 83, 85, 87, 96; Jan. 20, 1949, p. 87-88, 91-93; Feb. 3, 1949, p. 85, 87-89; Feb. 10, 1949, p. 82-83, 85.

Extensive fundamental and practical information.

6B-31. Hard Surfacing of Cast-Steel Propeller Blades. K. B. Young, H. J. Nichols, and M. J. Nolan. *Welding Journal,* v. 28, Feb. 1949, p. 153-157.

Examination of hard surfaced, cast steel propeller blades after service in salt water in both warm and cold climates.

6B-32. Galvanic Action Between Lead, Worthite and Other Acid-Resistant Alloys in Sulfuric Acid. W. E. Pratt and E. T. Collinsworth, Jr. *Corrosion,* v. 5, Feb. 1949, p. 39-44.

Mechanism involved in the changes of the relative potentials of lead and some stainless steels, notably Worthite, in H_2SO_4. The work was done in order to shed light on corrosion of chemical pumps in which Worthite is anodic to large areas of lead. The trouble can be avoided by use of an oxidizing agent such as sodium chromate, ferric sulfate, or copper sulfate; by re-aeration; or by insulation to prevent contact of the two metals.

6B-33. A Geographic Study of Deposits and Corrosion. F. N. Alquist. *Corrosion,* v. 5, Feb. 1949, p. 45-53.

Results of a survey of the compositions of water-formed deposits in boilers, pipe-lines, and condensers, and of resulting corrosion, for various areas of the U. S. Data are based on 143 samples from ten industrially important states.

6B-34. Mitigation of Corrosion on City Gas Distribution Systems. A. D. Simpson, Jr. *Corrosion,* v. 5, Feb. 1949, p. 59-69.

Corrosion-leakage experiences on city-distribution systems and experiences with cathodic protection.

6B-35. Cathodic Protection. (Continued.) *Light Metals,* v. 12, Jan. 1949, p. 43-50.

Concludes discussion of the Mg or Al anodes; problems of backfills. (To be concluded.)

6B-36. Weather Resistance of Porcelain Enamels. *Better Enameling,* v. 20, Feb. 1949, p. 6-8.

Previously abstracted from article by William N. Harrison and D. G. Moore in *Journal of the American Ceramic Society.* See item 6b-26, 1949.

6B-37. Contribution a l'étude de la corrosion des métaux par les carburants. (The Study of Metal Corrosion by Fuels.) P. Schläpfer and A. Bukowiecki *Métaux & Corrosion,* v. 23, Dec. 1948, p. 267-277.

The corrosive action of modern fuel components such as hydrocarbons, alcohols, aldehydes, ketones, and esters on Fe, Al, Zn, Pb, Cu, and Mg alloys were investigated.

6B-38. Corrosion des metaux par les liquides organiques. (Corrosion of Metals by Organic Liquids.) R. Dubrisay. *Metaux & Corrosion,* v. 23, Dec. 1948, p. 278-284.

The corrosion of Cu, Al, Ni, and Sn by fatty acids in organic solvent solutions of chlorine solvents (CCl_4, $CHCl_3$) and CH_3OH.

6B-39. Passivation of Iron and Cathodic Reduction of the Hydrate of Ferrous Oxide. (In Russian.) S. A. Rozentsveig and B. N. Kabanov. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 22, Oct. 1948, p. 1214-1218.

The yield from anodic oxidation of a pure iron electrode in a basic solution decreases considerably during repetition of cycles of "cathodic reduction-anodic oxidation". Causes were investigated.

6B-40. Uber periodische chemische Reaktionen. I. (Periodic Chemical Reactions. I.) K. F. Bonhoeffer. **II. Die kathodische Polarisation von Eisen in Salpetersäure.** (The Cathodic Polarization of Iron in Nitric Acid.) K. F. Bonhoeffer, Elfriede Brauer, and Gunter Langhammer. *Zeitschrift fur Elektrochemie und Angewandte Physikalische Chemie,* v. 51, Jan. 1948, p. 24-37.

Part I: conditions necessary for periodic reactions to occur; why, in

heterogeneous systems, preliminary conditions are especially favorable to periodic reactions. Part II: results of experiments on the topic indicated. 20 ref.

6B-41. Uber periodische Reaktionen. III. Der Refraktärzustand frisch-passiven Eisens in konzentrierter Salpetersäure. (Concerning Periodic Reactions. III. The Refractory State of Newly Passivated Iron in Concentrated Nitric Acid.) K. F. Bonhoeffer, Vera Haase, and Gunter Langhammer. **IV. Theorie der kathodischen Polarisation von Eisen in Salpetersäuer.** (IV. Theory of the Cathodic Polarization of Iron in Nitric Acid.) K. F. Bonhoeffer and G. Langhammer. *Zeitschrift fur Elektrochemie und Angewandte Physikalische Chemie,* v. 52, March 1948, p. 60-72.

The behavior of a passive iron wire in concentrated HNO_3 which had been previously cathodically activated by this acid. A theory concerning the chemical reactions involved in the cathodic polarization of iron is developed. 17 ref.

6C—Nonferrous

6C-6. Diffusion of Radioactive Copper During Oxidation of Copper Foil. Gilbert W. Castellan and Walter J. Moore. *Journal of Chemical Physics,* v. 17, Jan. 1949, p. 41-43.

Strips of copper foil were plated with radioactive Cu and oxidized in air at 800, 900, and 1000° C. From the distribution of radioactive Cu in the oxide, diffusion coefficients for cuprous ion in cuprous oxide were calculated. These measurements provide further evidence that diffusion of Cu^+ in Cu_2O is the rate-determining step.

6C-7. Recent Progress in Corrosion-Resisting Nickel-Base Alloy Castings. M. M. Hallett. *Nickel Bulletin,* v. 21, Nov. 1948, p. 154-156.

The Hastelloy series and their applications.

6C-8. Influence of Composition on the Stress-Corrosion Cracking of Some Copper-Base Alloys. D. H. Thompson and A. W. Tracy. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 100-109.

Certain high-copper alloys are susceptible to season-cracking or stress-corrosion cracking; possible explanations. Sheet-metal specimens of Cu-base alloys were exposed to static tensile stresses of 5000-20,000 psi. and simultaneous contact with a continuously renewed atmosphere containing 80% air, 16% ammonia, and 4% water vapor at 35° C. Time-to-failure was the primary measure of results. Supplementary tests in the absence of stress using weight loss or microscopical appearance as measures of attack were made.

6C-9. Corrosion in Multiple Layer Wound Coils. Howard Orr. *Communications,* v. 29, Jan. 1949, p. 22-23.

Progress made in overcoming chemical, electrolytic, and galvanic corrosion, major cause of most open-circuit failures in coils. (To be continued.)

6D—Light Metals

6D-2. Metal Thickness and Corrosion Effects; Inter-Relations With Aluminum and Its Alloys. F. A. Champion. *Metal Industry,* v. 74, Jan. 7, 1949, p. 7-9, 13.

Corrosion tests are usually made on relatively thin metal. Allowance must therefore be made for this in applying the results of such tests to the greater thicknesses used in service. Methods of allowing for differences in thickness.

6D-3. La protection de l'aluminium par des films de gélatine bichromatée. (Protection of Aluminum by Coatings of Bichromated Gelatin.) Jean Frasch. *Métaux & Corrosion,* v. 23, Nov. 1948, p. 261-265.

Preparation of solutions and their application. The gelatin contains Zn or Mn bichromate. Corrosion resistance of the coated pieces under severe conditions of various types.

6D-4. Rate of the Primary Step of Aluminum Oxidation at Room Temperature at Low Pressures. (In Russian.) N. K. Audrushchenko and P. D. Dankov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 62, Sept. 21, 1948, p. 353-356.

Data from comparative investigation of the primary oxidation step for a series of metals indicate a certain basic regularity, according to which the formation, on the surface of the metal, of a one or two-molecule oxide layer results in basic changes in the properties and behavior of such a layer. 10 ref.

6D-5. The Effect of Nickel on the Corrosion Resistance of High Purity Magnesium-Base Alloys. J. K. Davies. *Magnesium Review and Abstracts,* v. 8, Jan. 1948, p. 46-52.

Experimental results on corrosion of specimens of three British Mg alloys (two containing Al) to which up to 0.02% Ni had been added. The samples were immersed for two weeks in a 3% NaCl solution saturated with $Mg(OH)_2$.

6D-6. Corrosion Tests of a Heated Wing Utilizing an Exhaust-Gas-Air Mixture for Ice Prevention. George H. Holdaway. *National Advisory Committee for Aeronautics,* Technical Note No. 1791, Jan. 1949, 39 pages.

An investigation of the extent of corrosive attack in an aluminum alloy wing.

For additional annotations indexed in other sections, see: 3B-22; 11-39; 25A-25

7A—General

7A-18. Methods and Types of Cleaners for Various Metals. *Materials & Methods,* v. 29, Jan. 1949, p. 89, 91.

A tabular presentation.

7A-19. The Surface Appearance of Polished Metals—Physical and Psychological Considerations. G. E. Gardam and J. F. Mills. *Journal of the Electrodepositors' Technical Society,* v. 24, 1948, p. 17-26. (Reprint.)

The characteristic appearance of metal articles is shown to be connected with form and specular reflectivity of the surface. Psychologically, the attention-compelling property of such surfaces is due to confusion felt in viewing simultaneously the surface itself and the virtual images behind it. The quality of a polished metal surface is chiefly connected with the clarity of the images seen therein. The three main divisions of metal polishing operations: surface trueing, surface flowing, and haze removal.

7A-20. Barrel Finishing of Metal Products. Part 27. The Creation of a Barrel Finishing Laboratory. H. Leroy Beaver. *Products Finishing,* v. 13, Feb. 1949, p. 52, 54, 58, 60, 62, 64.

Proposes that such a laboratory be created under sponsorship of one or several technical societies. Points out benefits to be derived.

7A-21. Finishing Developments of 1948 in Review. Allen G. Gray. *Products Finishing,* v. 13, Feb. 1949, p. 66, 68, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94.

7A-22. Enameling Auto Window Moldings by Electrostatic Spray. T. S. Blair. *Iron Age,* v. 163, Feb. 10, 1949, p. 75-77.

Savings of 50-60% in enameling and lacquering auto-window garnish moldings achieved by installation of an electrostatic spray unit.

7A-23. Organic Linings for Chemical Equipment. Kenneth Tator. *Corrosion,* v. 5, Feb. 1949, p. 55-58.

The corrosion-preventive properties of the above; specific information concerning various types. Deals only with plastics and rubbers.

7A-24. Industrial Applications of the Sodium Silicates; Some Recent Developments. Reynold C. Merrill. *Industrial and Engineering Chemistry,* v. 41, Feb. 1949, p. 337-345.

Recent developments in application as adhesives, soap builders, detergents, metal cleaners, cements, and binders for briquets and other bonded materials. 116 ref.

7A-25. Pickling vs. Grit Blasting for Cleaning. J. F. Farrell. *Metal Finishing,* v. 47, Feb. 1949, p. 69-75.

Advantages and limitations of abrasive cleaning as compared to pickling. Equipment for the former, economic considerations, effect on finish, abrasives used, and typical applications.

7A-26. Nonmetallic Coatings. John Delmonte. *Machine Design,* v. 21, Feb. 1949, p. 97-102, 162.

Engineering characteristics of various types of protective coatings, including organic and porcelain-like finishes.

7A-27. Some Properties and Applications of a New Coating Lacquer. G. H. Ott. *Sheet Metal Industries,* v. 26, Feb. 1949, p. 367-370, 381.

New synthetic resin called Araldite, sold by Ciba of Switzerland. Mechanical and chemical properties of Araldite coatings on test specimens and on food containers and collapsible tubes.

7B—Ferrous

7B-15. Specially-Designed Building Facilitates Sandblasting of Railroad Cars. *Steel,* v. 124, Jan. 24, 1949, p. 66.

Unit used in preparation for rust-proofing and painting at plant of American Car & Foundry Co.

7B-16. Plastic Protection of Oil Well Drilling Pipe. H. Seymour. *Mine & Quarry Engineering,* v. 15, Jan. 1949, p. 20-22.

Results of laboratory and field tests on the above, also the coating procedure adopted.

7B-17. One-Fire White Enamels. Burnham W. King and C. Wesley Stull. *Journal of the American Ceramic Society,* v. 32, Jan. 1, 1949, p. 34-40.

Reactions and changes taking place during firing. Several possible steel and enamel combinations. The reflectance and chemical resistance of various white enamels fired at 1300 and 1500° F. 18 ref.

7B-18. Conveyorized Galvanizing. *West-*

ern Machinery and Steel World, v. 40, Jan. 1949, p. 78-80.
Galvanizing equipment and procedures in production of hot water and other tanks.

7B-19. Galvanized Welds. *Western Machinery and Steel World,* v. 40, Jan. 1949, p. 90-91.
Method for weld assembly of galvanized members, for their repair, and also for regalvanizing of worn areas. The process, known as "Galv-Weld," requires no flux, needs no sandblasting, makes no fumes, won't peel or chip, and makes a bond to the base metal that is superior to zinc-metal spray.

7B-20. Chromizing at 1700° to 1850° F. *Iron Age,* v. 163, Jan. 27, 1949, p. 65.
Chromizing process introduced in this country by Diffusion Alloys Corp. The parts to be treated are packed in conventional pack-carburizing containers, along with a ferrochromium base material and a suitable catalytic agent, and heated to 1700 to 1850° F., depending upon carbon content. Preliminary tests indicate promising corrosion resistance, heat resistance, and wear resistance characteristics.

7B-21. Applying Titanium Enamels Direct to Titanium Steels. *Iron Age,* v. 163, Jan. 27, 1949, p. 77-78. Condensed from article by J. L. Lannan.
See abstract from *Better Enameling;* item 7b-217, 1948.

7B-22. Galvanizing Spring Wire. *Wire Industry,* v. 16, Jan. 1949, p. 56.
Merits of hot dipping and electrodeposition of zinc on the above.

7B-23. The Acid Question—Hydrochloric and Sulphuric. *Wire Industry,* v. 16, Jan. 1949, p. 60.
Relative merits of the two acids as wire pickling agents.

7B-24. Porcelain Enameled Saggers Withstand Prolonged Furnace Service. *Finish,* v. 6, Feb. 1949, p. 35.
Carbon brushes are enclosed in small steel cylinders ("saggers") during a 5-day firing process at Speer Carbon Co. Porcelain enameling prevented rapid deterioration which otherwise took place due to blistering and scaling. Other advantages.

7B-25. Beizen, Atzen, Vorbehandeln, Entrosten und Rostschutzmittel. I. (Pickling, Etching, Pretreating, Rust-Removing, and Rust Preventive Agents. I.) Richard Springer. *Metalloberfläche,* v. 2, May-June 1948, p. 123-130.
A summary report on the advances made in the years 1935 to 1943. Consists of brief abstracts of specific publications (mainly German). (To be continued.)

7B-26. The Sodium Hydride Process. A New Method of Descaling Metals. N. L. Evans. *Journal of the Electrodepositors' Technical Society,* v. 24, 1948, p. 9-13; discussion, p. 14-15. (Reprint.)
The process and its advantages.

7B-27. Base Metal Selection Important to Successful Porcelain Enameling. Frank R. Porter. *Materials & Methods,* v. 29, Feb. 1949, p. 62-64.
The four classes of ferrous sheet commonly used; their drawing and enameling properties and their resistance to sagging and warping.

7B-28. Factors Affecting Bubble Formation in Vitreous Enamels. J. A. Clarke. *Sheet Metal Industries,* v. 25, Aug. 1948, p. 1609-1614.
Results of an experimental study of the above. Effects of various factors are shown by photomicrographs.

7B-29. Clean Iron and Steel Surfaces; Some Fundamental Considerations With Particular Reference to Vitreous Enamelling. T. P. Hoar. *Sheet Metal Industries,* v 25. Sept. 1948, p. 1805-1808, 1826.
The functions of the various degreasing, pickling, and rinsing processes from the fundamental point of view. Restricted to chemical cleaning.

7B-30. Some Notes on the Uses and Effects of Inhibitors in the Acid Pickling of Iron and Steel. Paul De Lattre. *Sheet Metal Industries,* v. 25, Oct. 1948, p. 1961-1964; Nov. 1948, p. 2181-2188.
Present status of theory and practice. Attempts a logical classification of known inhibitors. Extensive annotated bibliography of patent and journal literature.

7B-31. An Investigation into Some Physical Properties of Vitreous Enamels. J. H. Partridge. *Sheet Metal Industries,* v. 25, Nov. 1948, p. 2225-2229, 2240.
Differences in thermal expansion between iron and enamel were much greater than those found between the pairs of glass-metal seals, which must result in high stresses in enamels. No evidence of an oxide film between iron and enamel was detected, but gamma-iron crystals were found. Methods sometimes used to increase strength of glass-metal seals were unsuccessful for enamels.

7B-32. Some Chemical Aspects of Opacification of Vitreous Enamels. J. M. Stevels. *Sheet Metal Industries,* v. 25, Nov. 1948, p. 2234-2237, 2240.
Fundamental factors which govern opacification. General principles; types of opacifiers; influence of dispersed phase on opacity; and influence of vitreous phase on opacity. Reasons for the high refractive index of TiO_2.

7B-33. "Nitralising": A Pre-Enameling Treatment for Steel Sheets. T. Gilbertson and R. Robinson. *Sheet Metal Industries,* v. 25, Nov. 1948, p. 2238-2240.
Defects commonly encountered in enameling practice, and their causes and remedies. "Nitralising" consists of degreasing and acid pickling followed by immersion in fused sodium nitrate at about 500° C. On removal the metal is cooled, rinsed, again pickled a few minutes, and given a final rinse.

7B-34. The Influence of Certain Compounds of Lithium in Vitreous Enamels. Walter M. Fenton and Paul A. Huppert. *Sheet Metal Industries,* v. 25, Nov. 1948, p. 2255-2259.
The relationship between lithia and metallic oxides commonly used in ceramics, especially porcelain-enamel frits. Lithium carbonate was reacted at varying temperatures in the solid phase with the following compounds: Al_2O_3, Sb_2O_3, B_2O_3, Co_3O_4, MnO_2, MoO_3, SiO_2, TiO_2, ZrO_2, and $ZrSiO_4$. Results of plant tests; single-coat acid resistant ware; and white cover-coat enamels. 10 ref.

7B-35. The Relative Merits of Sulphuric and Hydrochloric Acids for Pickling. J. H. G. Willan. *Sheet Metal Industries,* v. 25, Dec. 1948, p. 2415-2418.

7B-36. The Influence of Titanium and Nitrogen on the Galvanising Properties of Iron Sheets. Heinz Bablik. *Sheet Metal Industries,* v. 26, Jan. 1949, p. 149-151.
Fundamentals; microstructures produced under various conditions.

7B-37. Finishing Automobile Components at the Kaiser-Frazer Plant. *Industrial Heating,* v. 16, Jan. 1949, p. 106-110, 112, 114, 116.

7B-38. Progress in Developing Palm Oil Replacements. E. L. H. Bastian. *Steel,* v. 124, Feb. 14, 1949, p. 84-88, 124.
Selection and properties of tinning oils. Experimental work at Battelle Memorial Institute under sponsorship of Shell Oil Co. has resulted in development of a mineral-base tinning oil and a make-up or replenishment oil. Advantages over palm, tallow, and other fixed oils used in hot tinning; results of full-scale production tests. Tinplate quality, lacquer adherence, and porosity were also satisfactory. A substitute for palm oil for grinding and polishing stainless-steel sheets.

7B-39. Preparing Special Steels for Enameling. Frank R. Porter. *Steel,* v. 124, Feb. 14, 1949, p. 90-92.
Emphasis on titanium enameling steel. Techniques developed for surface preparation of such steel, including experiences with welded areas.

7B-40. Titanium Enamels—A Review of a Big Forward Step. Burnham W. King. *Ceramic Industry,* v. 52, Feb. 1949, p. 66-67.
15 references.

7B-41. The Bending Qualities of Hot Dip Zinc Coatings. Wallace G. Imhoff. *Metal Finishing,* v. 47, Feb. 1949, p. 65-68, 75.
Factors which affect the above. Break test for lead content; effects of various metals in the coating; recommended coating procedures.

7B-42. Trouble Shootin'. John L. McLaughlin. *Better Enameling,* v. 20, Feb. 1949, p. 22-23.
Methods of correcting blister and burn off surface defects in porcelain enamels.

7C—Nonferrous

7C-6. High-Temperature Ceramic Coatings Developed for Molybdenum. *Steel,* v. 124, Jan. 24, 1949, p. 59, 82.
Recent development of National Bureau of Standards.

7C-7. Wood Grain, Leather and Other Textures Via Transfer Films. *Die Castings,* v. 7, Feb. 1949, p. 46-48, 50.
Method for application of the above to the curved surfaces of die castings.

7C-8. (Book). Jeweler's Workshop Practices. Leslie L. Linick. 500 pages. Henry Paulson & Co., 131 Wabash Ave., Chicago 3, Ill.
Practical information, including short cuts, formulas, shop kinks, and former trade secrets. Coloring and plating methods; cleaning, polishing, burnishing, and preserving methods. Information on the buying and testing of old gold articles.

7D—Light Metals

7D-7. Vitreous Enamels for Aluminum. (Continued.) P. J. Carlisle, A. J. Deyrup, and A. O. Short. *Finish,* v. 6, Feb. 1949, p. 33-34, 44.
Production procedures. Frequency of testing; free-alkali and chromate determinations on the bath; bath preparation from various chromate sources; chemical requirements; bath corrections; and typical color-coat formulas.

7D-8. The Present Position Regarding Chemical Pre-treatments for Magnesium Alloys. S. E. Mayer. *Magnesium Review and Abstracts,* v. 8, Jan. 1948, p. 29-45.
Classifies treatments according to the chemistry of the film formed, giving bath compositions. Tabulates the various proprietary methods in seven groups with information on inventor, alternative designation, literature or patent reference, bath compositions, method of application, alloys for which suitable, purpose of

treatment, general description, pretreatment necessary, and special comments.

7D-9. Surface Treatment and Finishing of Light Metals: Part I. S. Wernick and R. Pinner. *Sheet Metal Industries,* v. 25, Dec. 1948, p. 2463-2470, 2484.

Development of light metals, their applications, and finishes. Compositions of the principal wrought and cast aluminum alloys. (To be continued.)

7D-10. Chemical Brightening of Aluminum and its Alloys; A Description of a New Process. V. F. Henley. *Sheet Metal Industries,* v. 26, Feb. 1949, p. 382-384.

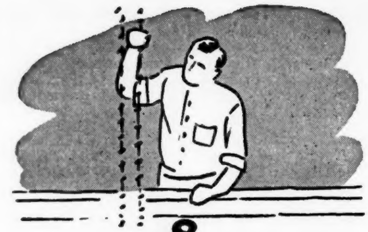
"Alpol" bright-dipping process developed in Britain and its applications.

7D-11. Le brunissage au tonneau des pieces en alliages d'aluminium. (Barrel Tumbling of Aluminum Alloy Pieces.) Charles Etienne. *Revue de l'Aluminium,* v. 25, Dec. 1948, p. 377-382.

Structural changes in the surface layer. Optimum conditions, including preparation for processing, time of tumbling, size of tumbling balls, their amount, etc. (To be continued.)

For additional annotations indexed in other sections, see:

6A-21; 6D-3; 19B-28; 22B-46



8 ELECTRODEPOSITION and ELECTROFINISHING

8-25. Investigations on Cylinder-Liner Wear. Warren G. Payne and William F. Joachim. *SAE Quarterly Transactions,* v. 3, Jan. 1949, p. 51-66; discussion, p. 66-68.

Previously abstracted from condensed version in *SAE Journal.* (See item 8-165, 1948.)

8-26. Thickness of Primary Growth Layers on the Face of Crystals on the Basis of Results of Micro-Interferometric Measurements. (In Russian.) K. M. Gorbunova and T. V. Ivanovskaya. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 22, Sept., 1948, p. 1039-1042.

The above was investigated for monocrystals of silver developed on a platinum cathode during electrolysis of a 3N solution of $AgNO_3$.

8-27. Oscillographic Investigation of Cathode Potentials During Growth of Thread-Like Silver Crystals. (In Russian.) K. M. Gorbunova and A. I. Zhukova. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 22, Sept. 1948, p. 1097-1099.

8-28. Ein verbessertes Beizverfahren zur Schnellprufung von Al-Cu-Mg-Verbundwerkstoffen auf Kupferdiffusion. (An Improved Pickling Process for Rapid Determination of Copper Diffusion in Al-Cu-Mg Plated Sheet Metal.) H. J. Seemann and M. Dudek. *Metalloberfläche,* v. 2, Apr. 1948, p. 84-87.

A new solution for the above.

8-29. Electrolytic Polishing of Brass Pressings. *Electroplating and Metal Finishing,* v. 2, Jan. 1949, p. 3-5, 42.

Procedure used by a British firm.

8-30. Bright Chromium Plating. *Electroplating and Metal Finishing,* v. 2, Jan. 1949, p. 6-11.

Tabulates the more usual faults and their remedies, with notes on operating conditions.

8-31. High Speed Automatic Nickel Plating With Notes on Rainbow in Chromium Plating and on Electropolishing of S.A.E. 1010 Steel. Albert Hirsch. *Plating,* v. 36, Feb. 1949, p. 138-140, 176.

Operating conditions which resulted in a minimum tendency toward the defect known as "rainbow." Experiences with electropolishing of SAE 1010 using a sulfuric-phosphoric bath.

8-32. Wire Screen Plating. *Plating,* v. 36, Feb. 1949, p. 142-147.

Equipment and procedures for wiredrawing, screen weaving, and continuous cleaning, electroplating of successive layers of Ni and Zn, and finally passing through infrared burners producing the Ni-Zn alloy phase characteristic of Coronizing.

8-33. Deposition of Precious Metal Alloys. IV. Bromide, Iodide and Fluoride

Systems. A. K. Graham, S. Heiman, and H. L. Pinkerton. *Plating,* v. 36, Feb. 1949, p. 148-153.

Chemistry of the halides of Ag, Au, Pt, and Cu; the general experimental plating procedure used; and the results obtained with different combinations.

8-34. Determination of Impurities in Electroplating Solutions. XI. Traces of Ammonium in Nickel Plating Baths. Earl J. Serfass, W. S. Levine, and R. M. Davis. *Plating,* v. 36, Feb. 1949, p. 158-162.

Methods and standard procedure developed. Ammonium is separated by alkali treatment and steam distillation with a micro Kjeldahl apparatus. It is treated with Nessler's reagent, and the color is measured photometrically. 19 ref.

8-35. Automatic Silver-Plating; Plant and Processes for High Output. W. E. Hesselberger. *Metal Industry,* v. 74, Jan. 28, 1949, p.66-68, 73.

8-36. Machine Tool Plating Installation Engineered for Efficiency and Appearance. Ezra A. Blount. *Products Finishing,* v. 13, Feb. 1949, p.20-28.

Production of chromium-plated machine tool parts by Landis Tool Co.

8-37. Decorative Electroplating on Aluminum. Glenwood J. Beckwith. *Metal Finishing,* v. 47, Feb. 1949, p. 48-54.

Relationship of foundry practice and successful plating, for die, permanent-mold, and sand castings; polishing and buffing of castings, extrusions, and stampings; ball burnishing; various cleaning procedures; chemical zinc coating; Cu, Ni, and Cr plating, and electropolishing of Cu plate; removal of Al from Ni baths; use of Al plating racks; salvaging of plated Al items.

8-38. A Semi-Bright Nickel Plating Process. Karl S. Willson and A. H. DuRose. *Metal Finishing,* v. 47, Feb. 1949, p. 55-57.

Process recently developed on a commercial scale. Characteristics are semi-bright luster, good buffability, and unusual ability to fill in surface irregularities. Operating features, advantages, and limitations.

8-39. Electroplating in the Spoon and Fork Trade. *Electroplating and Metal Finishing,* v. 2, Jan. 1949, p. 57-61. Based on paper by F. R. Hill, and accompanying discussion.

Equipment, procedures, and solutions. (To be continued.)

8-40. The Electrolytic Polishing of 18/8 Stainless Steel and Nickel Silver. H. Evans and E. H. Lloyd. *Journal of the Electrodepositors' Technical Society,* v. 22, 1946-47, p. 73-84.

Electropolishing experiments were carried out on 18-8 stainless and nickel-silver cutlery and a number of other components of various metals and alloys, in various electrolytes over a range of temperatures and with various current densities at the anode. 11 ref.

8-41. The Effect of the Basis Metal on the Electrodeposition of Brass. W. D. Rae. *Journal of the Electrodepositors' Technical Society,* v. 22, 1946-47, p. 85-96; discussion, p. 256-257.

Experiments indicate that nonuniformity of the electrodeposit is a major cause of unsatisfactory rubber-to-brass bonds and can arise either from depositing conditions or from the state of the base metal. Porosity increases danger of inclusion of foreign matter. Nonuniformity in the state of strain over the surface of the base metal and nonuniformity in chemical structure, especially when accompanied by nonuniformity in physical structure, also have a detrimental effect.

8-42. The Quantitative Adhesion of Nickel Electrodeposits to Aluminium Alloys. W. Bullough and G. E. Gardam. *Journal of the Electrodepositors' Technical Society,* v. 22, 1946-47, p. 169-188; discussion, p. 263-267.

Standard method which will yield adhesion in excess of ultimate tensile strength for most alloys; a slight variation is necessary for high-Mg or silicon alloys. A theory of the adhesion process is proposed.

8-43. Pre-Treatment of Zinc Die-Castings Prior to Bright-Nickel Plating. P. Berger. *Journal of the Electrodepositors' Technical Society,* v. 22, 1946-47, p. 207-218; discussion, p. 219-226.

Methods and sequence of operations. Undesirable phenomena such as over-cleaning, and their prevention. The reaction of zinc as a base-metal with electrodeposited under-coatings such as copper and brass, and the possible use of a Cu-Sn alloy as a substitute.

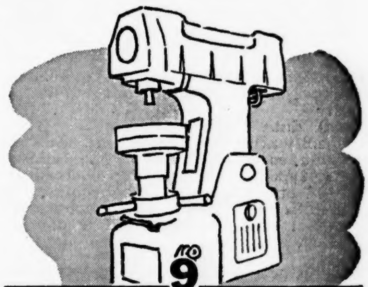
8-44. La résistance électrique de la cellule de polissage électrolytique et la superficie de l'anode. (Electrical Resistance in an Electropolishing Cell and the Anode Area.) Israel Epelboin and Claude Chalin. *Comptes Rendus* (France), v. 227, Oct. 27, 1948, p. 835-836.

Attempts to establish a relationship between resistance and anode area. Increase of the area results in decrease of resistance; agitation of the electrolyte, disturbing the anodic diffusion layer, also decreases the resistance caused by this layer. Therefore, the current-voltage curve may be changed for the same metal, the same bath, and otherwise identical conditions by variation in the anode area.

8-45 (Book). **Electro-Plating and Anodising. Ed. 4.** E. Molloy, editor. 230 pages. George Newnes, Ltd., Tower House, Southampton St., Strand, London, W.C.2, England. 7s. 6d. net.

Brief historical survey and general theory of the electroplating process. Industrial applications and techniques adopted for the electrodeposition of various metals. Types of equipment and plant layout. Causes and cures of troubles with nickel and chromium plating solutions. Electroplating of hardware; anodizing of aluminum, and testing of finished work.

For additional annotations indexed in other sections, see:
7A-21; 7B-22; 7C-8; 10A-34; 22A-33; 22B-46



9 PHYSICAL and MECHANICAL TESTING

9-29. The Determination of Stresses in Plastic Regions in Problems of Plane Flow. P. S. Symonds. *Journal*

of Applied Physics, v. 20, Jan. 1949, p. 107-112.

A simple numerical-graphical method is applied to determine stresses in plastic zones near elliptic free boundaries. The yield load of a tensile bar containing elliptic notches is obtained for a series of notches of varying sharpness. Some related problems.

9-30. Calibration of Testing Machines With a Proving Ring. R. C. A. Thurston and Samuel Goldberg. *Metal Progress,* v. 55, Jan. 1949, p. 59-60.

In two separate communications, the first author refers to D. H. Rowland's article in the Sept. issue, and proposes use of a standard medical stethoscope instead of the more expensive equipment proposed by Rowland. The second author recommends attachment of an auxiliary thumb screw to the micrometer to increase accuracy.

9-31. Mechanical Testing of Arc Welds. *Metal Progress,* v. 55, Jan. 1949, p. 64B.

A data sheet based on the joint specifications of AWS and ASTM. Includes information on the following types of arc welding electrodes: mild steel, low-alloy steel, corrosion resisting chromium and chromium-nickel steel, copper, and a copper alloy.

9-32. Etude critique des mesures de dureté et de microdureté. (Role du polissage électrolytique). (Critical Study of the Determination of Hardness and Microhardness. Role of Electrolytic Polishing.) Michel Moufiard. *Métaux & Corrosion,* v. 23, Nov. 1948, p. 245-254.

Different methods for the above and factors influencing accuracy. Data indicate that macro- and microhardness have different spheres of application. The first gives a general idea of hardness independent of the state of the surface; the second requires particularly careful surface preparation and indicates the slightest heterogeneity of the investigated materials. 14 ref.

9-33. Micro-Hardness Testing. E. Borje Bergsman. *British Chemical Digest,* v. 3, Jan. 1949, p. 101. Reprinted from *Anglo-Swedish Review,* Nov. 1948.

Instrument developed in Sweden can be used both for static indentation tests and for scratch tests with the same diagonal indenter.

9-34. Impact Strength of Metals at −253° C. (In Russian.) V. I. Kostenets, B. G. Lazarev, V. I. Khotevich, and M. G. Shikhman. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 18, Sept. 1948, p. 1149-1155.

Method for rapid determination of impact strength at the temperatures of liquid nitrogen (−196° C.) and liquid hydrogen (−253° C.). Data for a copper and two brasses.

9-35. Les essais de fluage et leurs enseignements pour la construction des turbines a gaz. (Creep Testing and its Results as Applied to the Design of Gas Turbines.) W. Siegfried. *Revue de Métallurgie,* v. 45, Oct. 1948, p. 361-373; discussion, p. 373.

Different methods of creep testing. Results indicate that the most accurate data are obtained by long-time creep testing of simple and notched specimens.

9-36. Le fluage et la relaxation a froid des fils d'acier tréfilés. (Creep and Relaxation of Drawn Steel Wires at Room Temperature.) Robert de Stryckег. *Révue de Métallurgie,* v. 45, Oct. 1948, p. 411-414; discussion, p. 414.

A new method for determination of the above. Only long-time testing will indicate true mechanical properties of such wires.

9-37. Construction of Ballistic Impact Test Machines. (In Russian.) G. P. Zaitsev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1356-1365.

Reviews theoretical bases of the above and presents comparative estimation of parasitic energy losses as compared to usual impact-test machines.

9-38. Analysis of Certain Characteristics of the Mechanical Properties of Metals at High Temperatures. (In Russian.) I. A. Oding. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1365-1377.

Existing methods for determination of the above.

9-39. Diagrams of Elongation and Contraction Under the Dynamic Application of Stresses. (In Russian.) P. G. Kirillov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1377-1379.

Proposes a new indirect method for determination of rate of deformation, acceleration, and applied stress in dynamic testing, consisting of the recording of a periodically vibrating beam of light on a moving plate.

9-40. Method of Testing Brittle Materials. (In Russian.) L. V. Abanov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p.1400.

A specially developed apparatus. A drawing indicates the basic principles of operation.

9-41. Apparatus for Recording Rate of Deformation of Metal Under Impact Stress. (In Russian.) V. F. Loshkarev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1401-1403.

A detailed description of the above, based on the use of optical recording.

9-42. A New Tyre, Brake and Undercarriage Testing Machine. J. R. Green and H. A. Wills. *Aircraft Engineering,* v. 21, Jan. 1949, p. 22-24.

Rig designed and built in Australia for testing of individual components or complete units within a static wheel load of 2500-50,000 lb. and with a maximum overal height of 10 ft.

9-43. Standard Bolt and Nut Tests Aid Both Makers and Users. W. N. Boyd. *Steel,* v. 124, Feb. 7, 1949, p. 97-99, 132.

New series of tension, elastic-proof-load, yield-strength, plastic-deformation, hardness, head, and stripping test procedures devolped by American Institute of Bolt, Nut and Rivet Manufacturers.

9-44. Fracture Characteristics of Ship Plate in Certain Small-Scale Tests. E. P. Klier, F. C. Wagner, and M. Gensamer. *Welding Journal,* v. 28, Feb. 1949, p. 50s-66s.

The slow-bend notch-bar test was used and two notch radii were studied. Results of edge notched bar tensile tests. Reference to Davidenkov's theory of failure. 14 ref.

9-45. Axial Tension Impact Tests of Structural Steels. W. H. Bruckner and N. M. Newmark. *Welding Journal,* v. 28, Feb. 1949, p. 67s-80s; discussion, p. 80s-88s.

Tests were made on a number of steels using notched specimens of various types. A standard specimen was developed, and tests were run at a number of different values of initial energy of the pendulum. Transition temperatures were determined from both energy absorption and reduction in area, with same results. Results indicate that the axial tension-impact test gives fundamental and reliable information regarding notch sensitivity.

9-46. The Determination of the Separate Stresses in Three-Dimensional Stress Investigations by the Frozen Stress Method. H. T. Jessop. *Journal of Scientific Instruments and of Physics in Industry,* v. 26, Jan. 1949, p. 27-31.

How an extension of the Lamé-Maxwell equations to three dimensions can be used in conjunction with "frozen stress" observations for the above.

9-47. A Simple Constant Stress Creep Test. J. C. Fisher and R. P. Carreker. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 178.

Method for obtaining constant stress which is especially suited to the testing of small wires, but may easily be extended to rods of any diameter.

9-48. Stroke of Fatigue Tester Is Varied Automatically. *Product Engineering,* v. 20, Feb. 1949, p. 90-91.

Constant force fatigue-testing machine built by Baldwin Locomotive Works.

9-49. Some Physical Characteristics of the Wire-Resistance Strain Gauge. Eric Jones. "Measurement of Stress and Strain in Solids," *Institute of Physics,* 1948, p. 1-26.

The flat-grid, the saw-tooth, and the woven type; behavior under strain; behavior of matrix and adhesive layer; effect on sensitivity of imperfect adhesion; effect of incomplete adhesive polymerization; effect of humidity; effect of change of resistance of ground connection; waterproofing methods; effect of temperature on resistance; current-carrying capacity; optimum resistance value; effect of temperature on strain sensitivity and on creep under load; "drift" in strain-gage indications; range of linearity and mechanical breakdown; setting time and hysteresis; fatigue under repeated loading; and limits of frequency response.

9-50. The Use of Resistance Strain Gauges in Combination, With Particular Reference to the Measurement of Component Loads. F. Aughtie. "Measurement of Stress and Strain in Solids," *Institute of Physics,* 1948, p. 27-41.

How the necessary circuit can be derived, particularly for the purpose of load measurement. Not concerned with solution of elastic problems which may be involved.

9-51. High-Frequency Strain Gauges. E. P. George. "Measurement of Stress and Strain in Solids," *Institute of Physics,* 1948, p. 42-48.

The change of resistance of ferromagnetic wires under tension was found to be much greater if the measurements were performed using high-frequency alternating current than if direct current was used. Possible application of this phenomenon to increasing the sensitivity of strain gages.

9-52. A Note on the Use of Resistance Strain Gauges in Ships. F. B. Bull. "Measurement of Stress and Strain in Solids," *Institute of Physics,* 1948, p. 49.

Use in connection with study of the relative behavior of welded and riveted ships' structures.

9-53. A Review of Some Recent Developments in Photoelasticity. W. A. P. Fisher. "Measurement of Stress and Strain in Solids," *Institute of Physics,* 1948, p. 50-61.

The more important developments in applied photoelasticity during the last eight years or so. 20 ref.

9-54. The Photography of Photoelastic Stress Patterns. H. McG. Ross. "Measurement of Stress and Strain in Solids," *Institute of Physics,* 1948, p. 62-64.

Equipment and procedures.

9-55. A Note on Time-Edge Stresses in Photoelastic Models. J. W. Fitchie. "Measurement of Stress and Strain in Solids," *Institute of Physics,* 1948, p. 65.

Trouble encountered with elimination of the above for a certain lot of phenol-formaldehyde plastic, since chemical reactions were apparently still taking place which caused residual stresses.

9-56. A Review of Some Strain-Measuring Devices. C. E. Phillips. "Measurement of Stress and Strain in Solids," *Institute of Physics,* 1948, p. 66-72.

Devices used to overcome a wide variety of strain problems. 14 ref.

9-57. The Measurement of Strain in Metals by X-Rays. D. E. Thomas. "Measurement of Stress and Strain in Solids," *Institute of Physics,* 1948, p. 73-82.

Methods and equipment, including theoretical basis.

9-58. A Note on Acoustic Strain Gauges. F. B. Bull. "Measurement of Stress and Strain in Solids," *Institute of Physics,* 1948, p. 85-86.

Method of operation; satisfactory experience with above type of gage.

9-59. The Use of X-Rays for Investigation of Residual Stresses in Ships' Structures. K. J. Pascoe. "Measurement of Stress and Strain in Solids," *Institute of Physics,* 1948, p. 83-84.

The apparatus used.

9-60. Summary of Additional Electrical Methods of Strain Measurement. G. E. Bennett. "Measurement of Stress and Strain in Solids," *Institute of Physics,* 1948, p. 87-110.

In addition to the resistance-wire and acoustic strain gages, others, using as a basis the two parameters, inductance and capacitance, which affect the flow of current through an electrical circuit, have been used extensively. Details of construction, operation, and circuits. 40 ref.

9-61. Changes in Internal Damping of Gas Turbine Materials Due to Continuous Vibration. G. B. Wilkes, Jr. *American Society of Mechanical Engineers,* Paper No. 48-A-95, 1948, 11 pages.

A pneumatically driven elevated-temperature fatigue machine and its control. Use of this machine to qualitatively determine initial damping as well as changes in damping of the test specimen during vibration. Variation in high-stress initial damping vs. temperature was qualitatively determined for four high-temperature alloys.

9-62. Comparison of High Temperature Alloys Tested as Blades in a Type B Turbo-Supercharger. William C. Stewart and H. C. Ellinghausen. *American Society of Mechanical Engineers,* Paper No. 48-A-96, 1948, 16 pages.

A series of jet tests, utilizing gas produced from combustion of diesel fuel-oil, as a means for comparing resistance of high-temperature alloys to hot-gas impingement. The deficiencies of this method for simulating conditions in a gas turbine. Tests were at temperatures from 1200 to 1500° F. 16 ref.

9-63. Determination of Plate Compressive Strengths at Elevated Temperatures. George J. Heimerl and William M. Roberts. *National Advisory Committee for Aeronautics,* Technical Note No. 1806, Feb. 1949, 20 pages.

Local-instability tests of extruded 75S-T6 Al-alloy H-sections at stabilized elevated temperatures up to 600° F. Results show that methods available for calculating critical compressive stress at room temperature can be used at elevated temperatures if the applicable compressive stress-strain curve is given.

9-64. Fotoelasticita. (Photoelasticity.) Giuseppe Manzella. *La Metallurgia Italiana,* v. 40, Nov.-Dec. 1948, p. 212-216.

A new method for photoelastic study of three-dimensional stresses by means of diffused light. Theoretical bases and possible practical applications. 10 ref.

9-65. Misura delle sollecitazioni col metodo della variazione di resistenza. (Determination of Stress by the Method of Variation of Electric Resistances.) Oreste Sappa. *La Metallurgia Italiana,* v. 40, Nov.-Dec. 1948, p. 219-222.

The method and its theoretical basis. Several illustrations of the application of this method.

9-66. (Book). **The Measurement of Stress and Strain in Solids.** 114 pages. 1948. *Institute of Physics,* London.

Proceedings of a conference arranged by the Manchester and District Branch, Institute of Physics, July 11-13, 1946. (Individual papers are abstracted separately.)

9-67. (Book). **Electrical Resistance Strain Gauges.** W. B. Dobie and P. C. G. Isaac. 114 pages. English Universities Press, Ltd., St. Paul's House, London, E.C.4, England. 15s. net.

Attempts to cover too wide a field for its size, and includes chapters on fundamentals of electricity and electronics which are adequately covered elsewhere. The presentation is far too elementary for engineers and research workers. It is, however, the first attempt to satisfy a long-felt want, and contains useful and comprehensive tables of available British and American gages and their characteristics. (From review in *Journal of Scien-*

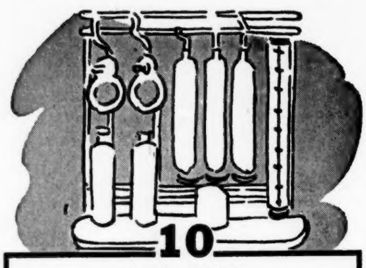
tific Instruments and of Physics in Industry.)

9-68. (Book). **The Mechanical Testing of Metals and Alloys.** Ed. 4. P. Field Foster. Sir Isaac Pitman and Sons, Ltd., Parker St., Kingsway, London, W.C.2. 18s. net.

The chapter on tensile and bending tests is brought into line with recent British Standard specifications. The introductory chapters present the elementary theories of elasticity, and of the structure of metals, and subsequent sections describe the essential features of a wide range of testing equipment and auxiliary apparatus; the testing of wires and sheet metal is also described. Includes tables of mechanical properties of metals and alloys. Particularly suitable for laboratory use, and for mechanical engineering students. (From review in *Engineering.*)

For additional annotations indexed in other sections, see:

3A-22-34



10 ANALYSIS

3A—General

10A-20. First Annual Review of Analytical Chemistry. Fundamental Analysis. *Analytical Chemistry,* v. 21, Jan. 1949, p. 2-173.

Consists of 29 articles covering the past five years. 3814 ref.

10A-21. Polarographic Method for Copper, Lead, and Iron Using a Pyrophosphate Background Solution. C. A. Reynolds and L. B. Robers. *Analytical Chemistry,* v. 21, Jan. 1949, p. 176-178. 16 references.

10A-22. The Measurement of Magnetic Properties of Rocks. J. McG. Bruckshaw and E. I. Robertson. *Journal of Scientific Instruments and of Physics in Industry,* v. 25, Dec. 1948, p. 444-446.

Apparatus for the above; also one for determination of direction and intensity of residual magnetism. Such measurements are of value in determining the amounts of ferromagnetic mineral constituents present, such as magnetite, titanomagnetite, pyrrhotite.

10A-23. A General Method for Quantitative Spectrochemical Analysis. (Preliminary Communication). (In English.) N. W. H. Addink. *Recueil des Travaux Chimiques des Pays-Bas,* v. 67, Nov. 1948, p. 690-696.

Two modifications of Harvey's method: one for rough estimation of element concentration and one for exact determination obtained by successive additions of the element being determined. Advantages of the new method.

10A-24. The Photometric Determination of Cobalt With Nitroso-R-Salt. (In English.) A. Claassen and W. Westerveld. *Recueil des Travaux Chimiques des Pays-Bas,* v. 67, Nov. 1948, p. 720-724.

A wave-length of 550 m_μ is recommended, using absorption cells of 2-5 cm. length. Interference by Cu and Ni. Interference by other elements.

10A-25. The Separation of Tin (IV) and Antimony According to F. W. Clarke. I. Basis of the Method. (In English.) P. Karsten and H. L. Kies. *Recueil des Travaux Chimiques des Pays-Bas,* v. 67, Nov. 1948, p. 753-760.

Experimental and theoretical study of the stability of the oxalate complexes with respect to H_2S as a function of pH. Clarke's method (described in 1870) is still considered superior to other methods reported more recently. 15 ref.

10A-26. Le dosage ponderal du chrome (Etude des précipités a l'aide de la thermobalance de Chevenard). (Gravimetric Determination of Chromium. (Study of Precipitates by Means of the Chevenard Thermobalance.)). Thérese Dupuis and Clément Duval. *Comptes Rendus* (France), v. 227, Oct. 18, 1948, p. 772-774.

Existing gravimetric methods for

the above were investigated in order to establish optimum procedures and also to determine the suitability of certain automatic techniques.

10A-27. Om användandet av räknebräden inom den kvantitativa spektralanalysen. (Calculating Boards in Quantitative Spectrochemical Analysis.) C. Georg Carlsson. *Jernkontorets Annaler,* v. 132, No. 11, 1948, p. 467-484.

Principles of some different types of calculating boards and of plate calibration by means of iron lines. Includes table of important lines.

10A-28. Sample Electrode Vapour Contamination of the Graphite Electrode in the Flat Surface Sparking Technique of Spectrochemical Analysis. (In English.) D. M. de Waal and S. M. Naude. *Spectrochimica Acta,* v. 3, May 1, 1948, p. 127-140.

10A-29. Zur Spektrochemie der Metalloide F, Cl, Br, J, S, Se. (Spectrochemistry of the Metalloids F, Cl, Br, I, S, and Se.) A. Gatterer. *Spectrochimica Acta,* v. 3, May 1, 1948, p. 214-232.

An easy and rapid method for qualitative and quantitative determination of the above. A tube of high-melting-point glass is charged with a small sample (10 to 20 mg.) and thoroughly evacuated. The spectra are excited without electrodes in a high-frequency magnetic field. The sensitivity limit is 0.001%, under favorable conditions, and quantitative determinations can be made down to 0.01% with an accuracy of 10%. Other advantages.

10A-30. Progress of Spectrochemical Analysis in Emission Spectroscopy up to 1943 in the U.S.S.R. (In English.) G. S. Smith. *Spectrochimica Acta,* v. 3, May 1, 1948, p. 235-246.

A review. 28 ref.

10A-31. Versuche zur fällungsanalytischen Abscheidung bzw. Bestimmung des Mangans als Triwismutoxypermanganat $Bi_3O_5H_2MnO_4$. (Investigation of an Analytical Precipitation Method for Determination of Manganese as the Tribismuthoxypermanganate, $Bi_3O_5H_2MnO_4$.) Fr. Hein and D. Arvay. *Angewandte Chemie,* ser. A, v. 60, June 1948, p. 157-158.

10A-32. Application of Solid Electrodes for Polarographic Analysis. (In Russian.) S. K. Chirkov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1300-1306.

Technique and sphere of application as compared with the commonly used mercury-drop electrodes. Data from a typical determination.

10A-33. Application of Solid Electrodes in Polarography. IV. Rectilinearly Moving Solid Electrodes. (In Russian.) E. M. Skobets, I. D. Panchenko, and V. D. Ryabokon. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1307-1312.

Includes a schematic drawing of the apparatus developed, using solid needle-shaped electrodes; typical polarograms obtained and their interpretation.

10A-34. Method for Rapid Determination of Sulfuric Acid in a Chromium Electrolyte. (In Russian.) V. A. Il'in. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1389-1390.

Proposes a rapid method (10-15 min.) based on the electrochemical processes taking place during electrolysis.

10A-35. Ein neues Verfahren zur Sauerstoffbestimmung in Pulvern aus Weicheisen, Stahl und einigen anderen Metallen. (A New Process for Determining the Oxygen Content of Powders of Soft Iron, Steel, and Several Other Metals.) Gerhard Naeser. *Stahl und Eisen,* v. 69, Jan. 6, 1949, p. 19-22.

The proposed volumetric process is especially adapted for analyzing carbon-containing iron powder.

10B—Ferrous

10B-11. Determining Small Amounts of Carbon in Steel. *Steel,* v. 124, Jan. 31, 1949, p. 60-61, 74, 78.

Experiments indicate that usual methods give high results. The low-pressure combustion method was found to give precise results for low-carbon steels, even when used on a routine basis.

10B-12. Novy zpusob mikroanalytickeho urceni hliniku v oceli. Upravena metoda oxychinolin-kyanidova. (New Method for Microanalytical Determination of Aluminum in Steel. Modified Oxyquinoline Cyanide Method.) Miroslav Sicha. *Hutnické Listy* (Metallurgical Topics), v. 3, Oct. 1948, p. 293-296.

A new method for microanalytical determination of metallic and total aluminum content in iron and steel is based on the precipitation of Al by an 8% $NaHCO_3$ solution.

10B-13. An investigation of Spectrochemical Sparking-Off Effects in the Flat Surface Sparking of Steels. (In English.) D. M. de Waal and A. Strasheim. *Spectrochimica Acta,* v. 3, May 1, 1948, p. 141-158.

An investigation of the above led to adoption of a short spark gap (1.5 mm.) and a blunt graphite electrode to limit the length of the spark. This improvement did not eliminate the drift of working curves. Analysis of sparking-off effects indicates a large oxidation effect and the role of water vapor in the spark atmosphere. It is suggested that variable atmospheric humidity may be one major cause of curve drift. 11 ref.

10B-14. Determination of Calcium and Magnesium in Iron Ore Using "Cationite". (In Russian.) Yu. I. Usatenko and O. V. Datsenko. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1323-1327.

A new method using organic electrolytes (organolytes). A newly developed variation of adsorption analysis is incorporated in this method. Experimental investigation confirmed applicability to analysis on an industrial scale.

10B-15. Apparatus for Determination of Carbon. (In Russian.) M. V. Babsev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1392-1394.

Existing methods for carbon determination in ferrous metals. A modified apparatus of simpler construction is said to give data of sufficient accuracy for many purposes.

10B-16. Shop Tests for Identifying Steels. *American Machinist,* v. 93, Feb. 10, 1949, p. 139.

A tabular presentation.

10B-17. Elektrolytische Isolierung der Karbide in legierten und unlegierten Stählen. (Electrolytic Separation of Carbides in Alloyed and Unalloyed Steels.) Walter Koch. *Stahl und Eisen,* v. 69, Jan. 6, 1949, p. 1-8.

The principles, conditions, and limitations of the separation of carbides from steels for analytical purposes by use of acids and electrolytically. 15 ref.

10B-18. Method of Volumetric Determination of Silicon in Cast Irons and Steels. (In Russian.) P. P. Budnikov and S. S. Zhukovskaya. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 21, Sept. 1948, p. 959-961.

A modified volumetric method based on the precipitation of potassium silicon fluoride followed by titration of the precipitate. Data obtained by above method and by the gravimetric method are compared.

10C—Nonferrous

10C-20. Chemical Research—Analytical. J. I Watters, Mark Fred, S. Sheel, Irene Corvin, and W. Byerly. *U. S. Atomic Energy Commission,* AECD-1988, May 18, 1948, 16 pages.

Data on gases evolved during the detarring of graphite crucible assemblies used in vacuum-fusion method for determination of oxygen. Attempts to increase accuracy of the copper-spark method in uranium analysis; several polarograph cells which have been used successfully with as little as 100 to 200 microliters of solution; experimental data obtained in the polarography of uranyl solutions in H_2SO_4 and HCl.

10C-21. Photographie des Fluoreszenzspektrums schwacher oder millimeterkleiner Leuchter. (Uran-Nachweis mit der Natriumfluoridperle, Untersuchung fluoreszierender Thermalwasserabsätze und dergl.) (Photography of Weak Fluorescence Spectra or Those From Sources Smaller Than a Millimeter in Cross-Section. (Uranium Detection by Means of Sodium Fluoride Beads, Investigation of Fluorescing Hot-Spring Deposits and the Like.)). Ferd. Scheminzky. *Spectrochimica Acta,* v. 3, May 1, 1948, p. 191-205.

Fluorescence spectrography permits not only qualitative determination of uranium, present in small quantities in waters of different origin or in minerals, but also quantitative determination of uranium through spectrophotometry. Construction of a miniature spectrograph which produces good photographic spectra with relatively short exposure times even for very small samples. 12 ref.

10C-22. Dosage du Bismuth dans les Plombs industriels. (Determination of Bismuth in Commercial Lead.) L. Bertiaux and R. Théry. *Bulletin de la Société Chimique de France,* Sept.-Oct. 1948, p. 1017-1019.

Bismuth is precipitated in the presence of lead by potassium bromate in alkaline solution.

10C-23. Le dosage pondéral de l'uranium (étude des précipités a l'aide de la thermobalance de Chevenard). (Gravimetric Determination of Uranium (Study of Precipitates Using Chevenard's Thermobalance).) Clément Duval. *Comptes Rendus* (France), v. 227, Oct. 4, 1948, p.679-681.

Existing methods of uranium determination. Optimum conditions for the above gravimetric technique.

10C-24. Volumetric Determination of Tin in Copper-Base Alloys. Milton Sherman. *Foundry,* v. 77, Feb. 1949, p. 87, 240, 242, 244.

A rapid volumetric method for tin in which the time of reduction is reduced to a few minutes. The sample is dissolved in 30% H_2O_2 and HCl and the tin is separated from the copper by an NH_4OH precipitation. A revised procedure incorporates several improvements.

10C-25. Fractional Titration of Amalgams as a Method of Analysis of Low-Melting-Point Metals. (In Russian.) V. A. Tsimmergakl and R. S. Khaimovich. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1289-1300.

Mathematical formulations of conditions of separation of metals (zinc, cadmium, tin, lead, bismuth). Technique of application of the method. Data are compared with those obtained by usual methods.

10C-26. Utilization of the Method of Fractional Leaching of Amalgams for Polarographic Determination of Small Concentrations of Low-Melting-Point Metals. (In Russian.) V. A. Tsimmergakl and R. S. Khaimovich. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1313-1318.

Determining Zn in Cd and Pb at concentrations of 0.0005-0.001% and also small amounts of Pb in Bi.

10C-27. Determination of Lead in Tin Bronzes. (In Russian.) Z. S. Mukhina. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1388.

A polarographic method using a 15% solution of phosphoric acid. Lead may be determined in amounts of 0.5% and above.

10C-28. A Direct Determination of Aluminum in Zinc Base Die Casting Alloys. Milton Sherman. *Die Castings,* v. 7, Feb. 1949, p. 24, 64-67.

Modified procedure using Alizarin red S and thioglycolic acid.

10C-29. Polarography of Selenium and Tellurium. II. The +4 States. James J. Lingane and L. W. Niedrach. *Journal of the American Chemical Society,* v. 71, Jan. 1949, p. 196-204.

11 references.

10C-30. A Method for Spectrochemical Determination of Silver in Ore Samples. Graham W. Marks and E. V. Potter. *Bureau of Mines,* Report of Investigations 4377, Dec. 1948, 14 pages.

Total-energy method.

10C-31. Drop Method for Detection of Iridium, Palladium, Platinum, Thallium, and Copper. (In Russian.) N. A. Tananaev, N. P. Ruksha, and A. N. Verkhorubova. *Zhurnal Analiticheskoi Khimii* (Journal of Analytical Chemistry), v. 3, Sept.-Oct. 1948, p. 271-275.

10C-32. Physiochemical Analysis of Systems Important in Analytical Chemistry. XIV. Investigation of the System K_2PdCl_4-KI-H_2O by the Method of Light Absorption. (In Russian.) I. V. Tananaev. *Zhurnal Analiticheskoi Khimii* (Journal of Analytical Chemistry), v. 3, Sept.-Oct. 1948, p. 276-283.

Applied to quantitative determination of palladium by turbidimetric, potentiometric, gravimetric, and colorimetric methods. A colorimetric method based on formation of PdI_4 ion is developed. 15 ref.

10C-33. Reaction of Nickel Ion With Dimethylglyoxine in the Presence of Oxidation Agents. (In Russian.) A. K. Babko. *Zhurnal Analiticheskoi Khimii* (Journal of Analytical Chemistry), v. 3, Sept.-Oct. 1948, p. 284-289.

The molar coefficient of extinction is convenient for comparison of the sensitivity of reactions. The sensitivity of this reagent in the case of nickel increases three-fold in the presence of oxidation agents. Optimum conditions for nickel determination.

10C-34. Investigation of the Precipitation of Heavy-Metal Ferrocyanides by an Amperometric Method. I. Investigation of the Precipitation of Copper Ferrocyanide. (In Russian.) N. G. Chovnyk and G. A. Kleibs. *Zhurnal Analiticheskoi Khimii* (Journal of Analytical Chemistry), v. 3, Sept.-Oct. 1948, p. 303-313.

Quantitative determination of copper by potassium ferrocyanide in an acid medium in a 1.0-5.0 N solution of potassium salts is proposed.

10D—Light Metals

10D-4. Rapid Identification of Wrought Aluminum Alloys. S. Witcoff and N. H. Simpson. *Modern Metals,* v. 4, Jan. 1949, p. 24-27.

Spot-test method developed by Consolidated Vultee.

10D-5. The Quantitative Spectrographic Analysis of Beryllium and its Compounds. A. Lee Smith and Velmer A. Fassel. *U. S. Atomic Energy Commission,* AECD-2100, June 22, 1948, 9 pages.

Method for the simultaneous quantitative spectrographic determination of Al, Ca, Cr, Fe, Mn, Mg and Si in beryllium and its compounds.

10D-6. The Simultaneous Determination of Nickel and Zinc in Secondary Aluminium Alloys by Means of the Polarograph. B. A. Scott. *Analyst,* v. 73, Nov. 1948, p. 613-615.

10D-7. Relacion entre las densidades de ennegrecimiento de las lineas espectrales y el estado de las aleaciones de tipo Duraluminio. (Relation Between the Density of Spectral Lines and Behavior of Alloys of the Duralumin Type.) Juan Manual Lopez de Azcona and Antonio Camunas Puig. *Spectrochimica Acta,* v. 3, May 1, 1948, p. 206-213.

The density curves of Al, Cu, Mg, Mn, Fe and Si in duralumin-type alloys are shown to depend upon thermal treatment of the electrodes, during natural and artificial aging at temperatures from room almost to the melting points. Results show agreement with prevailing theories of thermal alterations of mixed crystals in alloys.

10D-8. Méthodes d'analyse de l'aluminium. Le dosage du manganese. Le dosage du zinc. Le dosage du titane. (Methods of Analysis of Aluminum. Determination of Manganese. Determination of Zinc. Determination of Titanium.) *Revue de l'Aluminium,* v. 25, Nov. 1948, p. 358-360, 365; Dec. 1948, p. 375-376.

Several methods commonly used in France on an industrial scale. Nov. issue—manganese and zinc; Dec. issue—titanium.

10D-9. Extending the Range of the Spekker Absorptiometer, With Particular Reference to the Determination of Silicon in Aluminium Alloys. William Stross. *Metallurgia,* v. 39, Jan. 1949, p. 159-162.

The usual measuring range is limited to extinctions not exceeding 1.3. A technique by which this range can be doubled and its application to the determination of silicon.

10D-10. Lithium Color Reactions. (In Russian.) V. I. Kuznetsov. *Zhurnal Analiticheskoi Khimii* (Journal of Analytical Chemistry), v. 3, Sept.-Oct. 1948, p. 295-302.

A series of organic reagents which permit colorimetric determination of lithium in concentrations as low as 1:2,000,000. 18 ref.

For additional annotations indexed in other sections, see:
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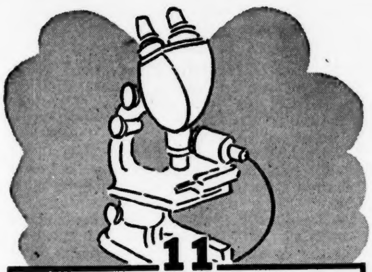


11 APPARATUS, INSTRUMENTS and METHODS

11-22. Determination of the Elastic Constants of Solids by Ultrasonic Methods. William C. Schneider and Charles J. Burton. *Journal of Applied Physics,* v. 20, Jan. 1949, p. 48-58.

A rotating-plate technique in which ultrasonic transmission is plotted as a function of the angle of incidence of the waves allows determination of velocities of dilatation and shear waves. From these data, Poisson's ratio and mechanical moduli may be determined. Details of an apparatus for making such measurements. The elastic constants of several metals were measured. 10 ref.

11-23. A Method for Measuring the Total Power of Small-Angle X-Ray Scattering. B. E. Warren. *Journal of Applied Physics,* v. 20, Jan. 1949, p. 96-97.

Techniques in common use are designed to measure the intensity of small-angle scattering in arbitrary units as a function of the angle of scattering. The method described gives the total power of small-angle scattering in absolute units, that is, the ratio of the total power per gram of scattering substance to intensity of the primary beam.

11-24. A Method for Studying the Forces Between Metals and Ionic Substances. Evelyn C. Marboe and W. A. Weyl. *Journal of Applied Physics,* v. 20, Jan. 1949, p. 124.

Method is based on the fact that atomic gold adsorbed at the surface of a white solid has no visible light absorption. Metallic gold in relatively large crystals is yellow brown. However, when changing from the atomic subdivision to the crystalline aggregate, gold goes through a very highly colored stage, in which traces of this metal can be detected by its characteristic light absorption.

11-25. The Effect of "Multiple Grounds" on Electron Microscope Images. W. L. Grube. *Journal of Applied Physics,* v. 20, Jan. 1949, p. 125.

Multiple grounds may cause double images, and when they are required, they should be made outside the microscope and only one lead brought into the cabinet.

11-26. New Type of Metallurgical Microscope. Tom Bishop. *Metal Progress,* v. 55, Jan. 1949, p. 60-61.

Instrument in which concave and convex mirrors replace conventional lenses. It can be used for photography in the ultraviolet region. An important metallurgical application is based on the long working distance. This has permitted photomicrographs to be taken at 500 diameters of metal surfaces at a bright red heat.

11-27. The Phase-Contrast Incident-Light Microscope. F. W. Cuckow. *Journal of the Iron and Steel Institute,* v. 161, Jan. 1949, p. 1-10.

Experiments in the comparative microscopy of metals lead to the conclusion that new information can be gained from a knowledge of the various levels existing in the surface of the prepared metallurgical specimen. Means available for study of these levels, and a new instrument. A comparative microscope in which a single field of view is divided into two parts, one of which is seen under phase-contrast conditions and the other under normal conditions. 23 ref.

11-28. Applications of the Plastic Replica Process to Surface Finish Measurement. C. Timms and C. A. Scoles. *Plastics* (London), v. 13, Jan. 1949, p. 24-28, 44.

Use of plastic impressions for measuring the degree of surface finish of large engineering components which are not readily accessible to the exploring probe of standard designs of surface-finish recording instruments. The process consists in taking a plastic replica, the impression thus obtained being measured directly by means of a stylus recording instrument. Typical recorder charts.

11-29. A Note on the Use of X-Ray Counter-Spectrometers for Single-Crystal Measurements. W. A. Wooster, G. N. Ramachandran, and A. Lang. *Journal of Scientific Instruments and of Physics in Industry,* v. 25, Dec. 1948, p. 405-407.

The above method was compared with an X-ray photographic method as a means of determining the integrated reflection of a number of reflections. Advantages and limitations of photographic, ionization, and counter-spectrometers.

11-30. An X-Ray Tube With Adjustable Focus. U. W. Arndt. *Journal of Scientific Instruments and of Physics in Industry,* v. 25, Dec. 1948, p. 414-416.

An experimental cathode assembly, designed to be fitted to the standard target head of a Crystallographic X-ray Unit, which makes it possible to obtain an adjustable focus 1 cm. in length and down to 1/3 mm. in height, without a surrounding halo. Stability of the tube current.

11-31. The Preparation of Titanium and Vanadium X-Ray Targets. Alan D. McQuillan. *Journal of Scientific Instruments and of Physics in Industry,* v. 25, Dec. 1948, p. 423.

Technique developed.

11-32. Reproduction of Radiographs; Method of Producing Contact Prints in Correct Tone. D. F. B. Tedds and E. D. Priday. *Metal Industry,* v. 74, Jan. 7, 1949, p. 12-13.

A novel and original method of producing contact prints and slides by use of a glass transparency. Methods of producing the glass transparency, reducing large X-ray photographs, and preparing the facsimile negative.

11-33. Finsiktningsundersökningar. (Fine-Screening Investigations.) II. Sture Mörtsell and P. V. Villner. *Jernkontorets Annaler,* v. 132, No. 11, 1948, p. 459-466.

Three different vibrating screens, each with an area of 0.5-0.7 sq. m., were compared, showing that one screen gives results of superior quality to the others. If only quantity is considered, one of the other screens seems to be the best. For screening through 0.20 mm. mesh, vibration of about 1 mm. seems to be most suitable. The effect of dilution was also found to be important.

11-34. Application of Ultrasonics to Technology and Physics. (In Russian.) S. Ya. Sokolov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1328-1335.

Application for determination of metal structures, detection of defects, determination of casehardening thicknesses, etc.

11-35. Simultaneous Measurement of the Optical Constants of Metals Over a Wide Wave-Length Range. J. Bor and B. G. Chapman. *Nature*, v. 163, Jan. 29, 1949, p. 183-184.

Experimental system; pattern obtained for aluminum. The time involved in the new method is much shorter than other methods, which require use of monochromatic light.

11-36. X-Ray Camera for Precision Measurements of Crystals. (In Russian.) M. M. Umanskii, S. S. Kvitka, and Yu. A. Bagaryatskii. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1343-1350.

A special camera for precision measurement of monocrystalline lattices. Advantages for this apparatus as compared to those commonly used.

11-37. Film Adapter for Microscopes. (In Russian.) A. A. Dyatlov and A. I. Berkhoshapov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1397-1399.

Existing adapters are said to be designed primarily for biological work, hence awkward for metallography. Adapter more suitable for such work.

11-38. Selection of Material for the Pole Pieces of an Electron Microscope. (In Russian.) Sh. M. Rakhimov and N. G. Sushkin. *Zhurnal Technicheskoi Fiziki* (Journal of Technical Physics), v. 18, Sept. 1948, p. 1166-1172.

The influence of pole pieces of different materials on the refractive power of the magnetic objective lens and distribution of the magnetic field along the axis of the lens was investigated. Experimental results which confirm the Glaser formula.

11-39. Die Verwendung von galvanischen Elementen zur Messung des in Wasser gelosten Sauerstoffes und zur Korrosionsanzeige. (Using Voltaic Cells for Measuring the Amount of Oxygen Dissolved in Water and for Indicating Corrosion.) F. Todt. *Archiv fur Metallkunde*, v. 1, Nov.-Dec. 1947, p. 469-471.

Method claimed to have important advantages over Winkler's chemical method, especially in the control of waste water and in the observation of biological and oxygen-consuming reactions in water. It can also be used for testing paint and other protective coatings on metals. 14 ref.

11-40. Debye-Scherrer-Aufnahmen an Pulverplättchen. (Debye-Scherrer Recordings on Small Powder Plates.) Georg Menzer. *Zeitschrift fur Naturforschung*, v. 2a, June 1947, p. 335-343.

Disadvantages of the bar method; absorption factors of the plate method as well as its advantages and disadvantages. 11 ref.

11-41. A Vacuum Dilatometer for Routine Metallurgical Investigations. T. Land and B. Sugarman. *Metallurgia*, v. 39, Jan. 1949, p. 126-128.

Apparatus permits an over-all accuracy in thermal expansion coefficients of 1 x 10^{-7} per °C., and utilizes a 3-in. rod-shaped specimen. Expansion is transmitted to a dial gage previously calibrated by means of a silica rod. Transformation temperatures are indicated to within about 2° C., and the apparatus is capable of operation up to 1000° C.

11-42. Surface Reflectometer for Evaluating Polished Surfaces. E. A. Ollard. *Journal of the Electrodepositors' Technical Society*, v. 24, 1948, p. 1-8. (Reprint.)

Instrument for evaluating the polish on a flat metal surface by a single reading. It will give a quantitative comparison of different surfaces in line with the results of visual examination. Suitability for electropolished surfaces.

11-43. An Improved X-Ray Diffraction Camera. W. Parrish and E. Cisney. *Philips Technical Review*, v. 10, Dec. 1948, p. 157-167.

Improved Debye-Scherrer camera produced by North American Philips Co. Various design factors.

11-44. Thickness of Composite Copper-Nickel Coatings Measured by Nondestructive Magnetic Method. *Steel*, v. 124, Feb. 7, 1949, p. 96.

Method developed by National Bureau of Standards involves measurement of attractive force between the plated specimen and two permanent magnets of different strengths.

11-45. High Temperature X-Ray Diffraction Techniques. J. J. Lander. *Review of Scientific Instruments*, v. 20, Jan. 1949, p. 82-83.

Three types of accessories for X-ray studies of materials at high temperatures. Two of them are suitable for the study of materials in high vacua or controlled atmospheres, and the third may be adapted for high vacuum but has been used with controlled atmospheres.

11-46. Microscopy of High-Temperature Phenomena. *Industrial Heating*. v. 16, Jan. 1949, p. 122, 124. A condensation based on paper by Henry N. Baumann, Jr.

New optical system in which the object being studied is several inches away from the lenses, thus making possible microscopic study of bodies too hot to be examined by conventional methods. This system has also been applied to motion-picture photomicrography, so that changes occurring at high temperatures can be observed directly.

11-47. Radio-Frequency Mass Spectrometry—A Promising New Analytical Method. Willard H. Bennett. *Instruments*, v. 22, Jan. 1949, p. 38-39.

Methods and equipment.

11-48. Influence of Shape on the Resistance of Bismuth Monocrystals in Magnetic Fields. (In Russian.) E. S. Borovik and B. G. Lazarev. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 62, Oct. 11, 1948, p. 611-614.

Specially developed apparatus and technique was used in determination of the influence of the shape of the specimen on the form of the rotation diagram during measurement of resistance in a transverse magnetic field.

11-49. Electron-Microscope Investigation of Steel Structure. (In Russian.) N. N. Buinov and R. M. Lerinman. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 62, Oct. 11, 1948, p. 629-632.

Replica technique using a colloidal film. Composition of the colloidal substance and type of etchant.

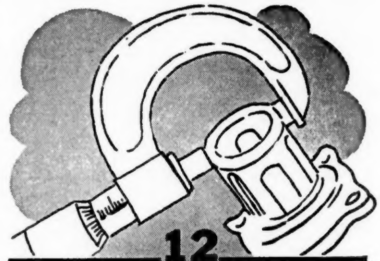
11-50. Mesure, par les rayons X, de l'épaisseur des films minces déposés sur supports microcristallins. (Determination of Thickness of Thin Films Deposited on Crystalline Surfaces.) Charles Legrand. *Comptes Rendus* (France), v. 227, Oct. 27, 1948, p. 831-833.

An X-ray diffraction method for the above, particularly for coated metal surfaces. Theoretical bases and sphere of application of the method.

11-51. Sur la réalisation et l'utilisation de faisceaux de rayons X tres fins, de l'ordre de quelques microns. (Production and Utilization of Very Thin Bundles of X-Rays of the Order of a Few Microns in Thickness.) Fernand Fournier. *Comptes Rendus* (France), v. 227, Oct. 27, 1948, p. 833-834.

Applicability for determination of crystal boundaries and microinclusions in alloys.

For additional annotations indexed in other sections, see:
4B-7; 5A-12



12 INSPECTION and STANDARDIZATION

12-21. Air-Electric Gaging Automobile Engine Components. A. H. Allen. *Steel*, v. 124, Jan. 24, 1949, p. 56-58, 82.

Cylinder blocks, heads, pistons, piston pins, connecting rods, crankshafts and camshafts are among the parts checked by new types of automatic gaging equipment.

12-22. Defects in Steel; Some Methods of Obtaining Permanent Records. H. Thompson. *Iron and Steel*, v. 22, Jan. 1949, p. 5-7.

The photographic method; reflex printing; ink prints; sulfur prints; sulfur-print reproduction; crack prints; oxide printing; phosphorus printing; lead prints; nickel prints; and magnetodefectograms. 10 ref.

12-23. Quality Control Review—Summarize Test Procedures for Steel Foundrymen. John W. Juppenlatz. *American Foundryman*, v. 15, Jan. 1949, p. 38-48.

12-24. Standard Tests for Bolts and Nuts. W. N. Boyd. *Fasteners*, v. 5, no. 3, [1948], p. 7-9.

Tests developed by American Institute of Bolt, Nut and Rivet Manufacturers.

12-25. Are the H-Steels Being Accepted? T. C. Du Mond. *Materials & Methods*, v. 29, Jan. 1949, p. 67-69.

Present status of acceptance. Buying and using steels specified according to hardenability limits seems to prove satisfactory from all viewpoints.

12-26. Influence des dimensions de la cristallisation sur la propagation des ultra-sons dans les métaux. (Influence of Crystal Dimensions on the Propagation of Ultrasonic Vibrations in Metals.) Paul Bastien, Jacques Bleton, and Emmanuel de Kerverseau.

Comptes Rendus (France), v. 227, Oct. 11, 1948, p. 726-728.

Certain anomalies, observed during use of the above for detection of defects, are believed to be produced by vibration of individual crystals, which resonate, thus producing ultrasonic vibrations of their own.

12-27. Ultrasonic Flaw Detector. *Electronics,* v. 22, Feb. 1949, p. 124.

Whereas X-ray is practical only for metal thicknesses up to about 6 in., the technique outlined tests solid metal from 0.25 in. to 30 ft. in thickness.

12-28. Bibliography on Industrial Radiology, 1945-1948. Herbert R. Isenburger. *St. John X-Ray Laboratory,* Califon, N. J., 1948, 15 pages.

This mimeographed listing contains 333 additional references. It is the 2nd supplement to "Industrial Radiology." Ed. 2, 1943, John Wiley & Sons, New York. The first supplement was published in 1945.

12-29. Oldsmobile Uses Modern Gaging Techniques in Producing New Engine. Herbert Chase. *Iron Age,* v. 163, Feb. 10, 1949, p. 78-82.

12-30. Magnetic Particle Testing. L. B. Jones. *American Society of Mechanical Engineers,* Paper No. 48-A-79, 1948, 12 pages.

Method for detecting cracks, discontinuities, and other defects in magnetic material by the application of magnetic forces and paramagnetic particles. 53 ref.

12-31. Roller Stock Gage That Increases Die Accuracy. Roger Isetts. *Machinery* (American), v. 55, Feb. 1949, p. 201-202.

12-32. British Radiographic Lab. A. Wilson. *Welding Engineer,* v. 34, Feb. 1949, p. 46-48.

Laboratory of British Admiralty and its application to weld radiography.

12-33. Comparative Magnesium-Alloy Specifications. *Welding Engineer,* v. 34, Feb. 1949, p. 65.

A table.

12-34. Selection of Measuring Rolls for 30-Degree Involute Splines. Joseph Silvagi. *Tool Engineer,* v. 22, Feb. 1949, p. 26-28.

Use of cylindrical measuring rolls for gaging gears and splines. Method of determining the correct size of rolls for use in a given application.

12-35. Fluorescent Liquid Inspection. Ray McBrian. *American Society of Mechanical Engineers,* Paper No. 48-A-80, 1948, 4 pages.

Use of Magnaglo and Zyglo for railroad prime-mover axles and for various engine parts.

12-36. Statistical Inspection Pictures Cut Material Procurement Costs. Dorian Shainin. *American Society of Mechanical Engineers,* Paper No. 48-A-88, 1948, 11 pages.

Mechanics of the "Lot Plot" sampling inspection plan.

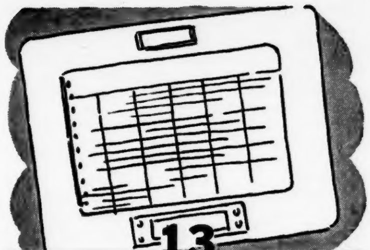
12-37. (Book). **A.S.T.M. Standards on Copper and Copper Alloys.** Rev. ed. 504 pages. 1948. American Society for Testing Materials, 1916 Race St., Philadelphia, Pa. $4.35.

All the society's specifications relating to copper and copper alloys are included.

For additional annotations indexed in other sections, see: 22B-52; 24B-4

How Well Informed Are You?

See Quiz on Page 56



13 TEMPERATURE MEASUREMENT and CONTROL

13-5. Advanced Temperature Measurement; Steel Industry's Methods for Extreme Ranges. *Chemical Age,* v. 60, Jan. 1, 1949, p. 15-16.

Methods used on the Continent.

13-6. Photoelectric Control of High-Temperature Furnaces. F. C. Todd. *Electronics,* v. 22, Feb. 1949, p. 80-83.

By means of the equipment described, temperatures up to 2500° C. can be held within 1% for days. A vacuum phototube serves as sensing element feeding cascaded d.c. bridge amplifiers or an a.c. bridge, followed by an amplifier that actuates on-off or continuous phase-shift thyratron control of the furnace.

13-7. Measuring Steel Bath Temperatures by Purged Tube Method. *Steel,* v. 124, Jan. 31, 1949, p. 65-66.

Equipment developed by Brown Instrument Co. and its method of use.

13-8. Pyrometer for Molten Steel. *Electronics,* v. 22, Feb. 1949, p. 152, 154, 156.

Photoelectronic apparatus developed by Brown Instrument Co. A 7-ft. sighting tube is immersed in the molten metal. Compressed air forced through the tube forms a pocket in the metal.

13-9. Thermocouple for Determination of Steel-Bath Temperatures. (In Russian.) V. G. Gruzin. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1396-1397.

Describes and diagrams equipment.

13-10. Steel Temperature Measurement and Control of Billet Heating Furnaces. *Industrial Heating,* v. 16, Jan. 1949, p. 82. A condensation based on paper by Fred S. Bloom.

13-11. Laboratory Evaluation of a Method Proposed by Gnam for Measuring the Temperature of Rotating Parts. Andrew I. Dahl and Paul D. Freeze. *Journal of Research of the National Bureau of Standards,* v. 41, Dec. 1948, p. 601-607.

A rotating circuit, consisting of a thermocouple in series with the rotor coils of a converter, and a stationary circuit, consisting of the stator coils of the converter and a transformer, are linked magnetically. One thermocouple junction is fixed to the rotating part, and the other protrudes from a hollow shaft into the furnace. Full-scale application seems practicable.

13-12. Life Test for Pyrometers. J. T. Cataldo. *Electrical Manufacturing,* v. 43, Feb. 1949, p. 129-130, 132.

Device which automatically applies alternate hot and cold cycles to pyrometer instruments to evaluate service life.

13-13. A Six-Point, High-Speed, Thermocouple Temperature-Recording Equipment. J. D. Watson and H. E. Dixon. *Journal of Scientific Instruments and of Physics in Industry,* v. 26, Jan. 1949, p. 17-18.

13-14. The Electronic Measurement and Control of Heat. Part I. (no subtitle) **Part 2. High Temperatures in Industrial Processes.** John H. Jupe. *Electronic Engineering,* v. 21, Jan. 1949, p. 13-16; Feb. 1949, p. 48-51.

Methods and diagrams of circuits. (To be concluded.)

13-15. Temperature Control for Hardening Drill Steel. H. O. Howey. *Canadian Mining and Metallurgical Bulletin,* v. 42, Jan. 1949, p. 10.

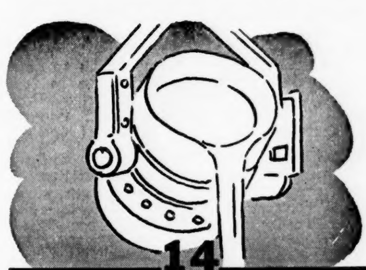
Radiation-type thermocouple, connected to a high-internal-resistance pyrometer, used to regulate hardening temperatures of conventional drill steel.

13-16. Response Characteristics of Thermometer Elements. A. J. Hornfeck. *Transactions of the American Society of Mechanical Engineers,* v. 71, Feb. 1949, p. 121-132; discussion, p. 132-133.

The significance of time constant as a basis of comparing elements; effects of varying design factors such as socket size, materials, and internal element structure. Methods for determining temperature-vs.-time response curves of elements in a medium whose temperature changes suddenly, uniformly, and sinusoidally. 11 ref.

13-17. The Use of Precious Metal Thermocouples at High Temperatures. M. K. McQuillan. *Division of Aeronautics, Council for Scientific and Industrial Research, Commonwealth of Australia* (Melbourne), Structures and Materials Note 171, Oct. 1948, 7 pages.

A study on effects of heating platinum, platinum-rhodium thermocouples in air, in vacuum, and in hydrogen; and in the presence of various refractory materials.



14 FOUNDRY PRACTICE

14A—General

14A-10. Uses Standard Permanent Mold Equipment. *American Foundryman,* v. 15, Jan. 1949, p. 51. Based on talk by E. C. Hoenicke.

Equipment and procedures at Caton Mfg. Co., Detroit.

14A-11. Foundry Drying Systems. John B. Morton. *Foundry Trade Journal,* v. 85, Dec. 30, 1948, p. 619-626; v. 86, Jan. 6, 1949, p. 3-8.

The various types used for drying of core sand, cores, molds, and ladles.

14A-12. Effect of Varying Particle Size Distribution on Green Permeability and Strength of a Natural Molding Sand. Mary T. Zemantowsky and Alexander I. Krynitsky. *Foundry,* v. 77, Feb. 1949, p. 66-71, 272-273.

Albany sand was used as the basic material and test mixtures were prepared by making separate additions—10, 20, and 40%—of each of three selected sieve fractions of washed silica sand.

14A-13. Large Scale Production of Small, Intricate Castings. Robert H. Herrmann. *Foundry,* v. 77, Feb. 1949, p. 80-83, 172, 174-175, 178-179.

Procedures and equipment of Precision Metalsmiths, Cleveland, a comparatively new firm engaged in precision investment casting.

14A-14. Die Coatings for Copper-Base Alloy Permanent Mold Casting. James L. Erickson. *Foundry,* v. 77, Feb. 1949, p. 88-89, 180, 184, 187, 190, 192, 194, 196, 198.

Reasons for using die coatings and a few typical formulations.

14A-15. Core Baking; 2 Minutes v. 4 Hours. Victor E. Hillman. *Iron Age,* v. 163, Feb. 3, 1949, p. 116-121.

Baking cores in 2 min. through use of an electronic core-baking unit. Advantages are high-speed baking, small space requirements, lower baking temperature, better physical characteristics, and less gassing in the mold. Core mixes are also described.

14A-16. Etude de graphites pulvérulents comme isolants de fonderie. (Study of Powdered Graphite as an Insulating Material in the Foundry.) Pierre Nicolas. *Fonderie,* Oct. 1948, p. 1354-1356.

The properties and structure of different types of graphites were investigated with respect to their use as mold coatings. Includes X-ray diffraction patterns.

14A-17. Fabrication des diverses pieces d'un moteur a explosion. (Production of Miscellaneous Parts of Internal-Combustion Engines.) Jean Duport and Gabriel Joly. *Fonderie,* Oct. 1948, p. 1357-1360.

Choice of alloy and casting process (sand or chill). Tables show compositions of the different alloys tested and mechanical properties when cast by each of the above methods.

14A-18. Promoting Riser Fluidity. E. D. Boyle. *American Foundryman,* v. 15, Feb. 1949, p. 45-50.

Use of diatomaceous earth to control directional solidification in ferrous and nonferrous castings. Possible feeding methods and use as "hot-top" for Ni-Cu billets.

14A-19. Special Techniques Reduce Composite Casting Losses. Arthur K. Higgins. *American Foundryman,* v. 15, Feb. 1949, p. 54-57.

Previously abstracted from *Metal Progress.* See item 14a-173, 1948.

14A-20. (Book). **Development of the Metal Castings Industry.** Bruce L. Simpson. 246 pages. 1948. American Foundrymen's Society, 222 West Adams St., Chicago 6, Ill.

A pictorial story and commentary on the history and progress of the foundry. Facts and data upon which to build programs of public interest.

14A-21. (Book). **Metal Casting of Sculpture.** Carl D. Clarke. 175 pages. Standard Arts Press, Butler, Md. $6.50.

Procedures used in producing statuary and ornamental castings from original models by use of glue, flexible compound, agar, rubber, and resilient plastic molds. Includes formulas for materials, methods of preparation, and use. Other chapters relate to the roman joint, wax-resin and investment compounds; making the lost wax cast; metals and their alloys; furnaces; finishing the cast; defects and their repair; and metal coloring.

14B—Ferrous

14B-10. Roll Founding: Some Physical and Metallurgical Factors. W. G. Scott. *Iron and Steel,* v. 22, Jan. 1949 p. 11-16.

Factors involved in casting of rolling-mill rolls and recommended procedures.

14B-11. Casting Stainless Steel Centrifugally in Permanent Metal Molds. Herbert J. Cooper. *Iron Age,* v. 163, Jan. 27, 1949, p. 56-59.

Techniques developed primarily as a means of meeting the rigid requirements of large rings used in the Nene jet engine. The process holds promise for many industrial applications such as pump liners, seat rings, and other cylindrical shapes.

14B-12. Iron Melting Costs in the Cupola and Electric Furnace. A. W. Gregg. *Foundry,* v. 77, Feb. 1949, p. 78-79, 244, 246.

Comparative cost analysis. Recommends use of the cupola if good coke is available; otherwise duplexing with cupola and electric furnace may be necessary.

14B-13. Old Foundry Acquires the New Look. Robert O. Mayer. *Foundry,* v. 77, Feb. 1949, p. 248, 250, 252, 254.

Equipment and procedures of Haven Malleable Castings Co., Cincinnati.

14B-14. Doba pobytu kovové vsazky v kuplovne. (Time Necessary for Melting the Cupola Charge.) Mikulas Czyzewski. *Hutnické Listy* (Metallurgical Topics), v. 3, Nov. 1948, p. 330-335.

Fundamental equations of the cupola process with special attention to the period required for heating and for melting. An equation for calculating the heat-transfer factor for gas to metal. Individual factors influencing melting.

14B-15. Ironfounding and the Metallurgy of Cast Iron. J. E. Hurst. *Metallurgia,* v. 39, Jan. 1949, p. 129-132.

Developments since World War I in cast-iron metallurgy, production methods, plant and equipment, and in foundry education, training, and research.

14B-16. Producing Nodular Graphite With Magnesium. C. K. Donoho. *American Foundryman,* v. 15, Feb. 1949, p. 30-37.

Results of more than 150 experimental heats, with several casts from each heat, using magnesium additions. Methods of adding the magnesium and results.

14B-17. Reclaim Ferrous Foundry Sand. E. C. Jeter. *American Foundryman,* v. 15, Feb. 1949, p. 40-44.

Roasting method used during the war by aluminum and magnesium foundries was unsatisfactory for ferrous foundry practice. Advantages and disadvantages of wet and dry methods.

14B-18. Steelmaking at a British Foundry. Norman F. Dufty. *Foundry,* v. 77, Feb. 1949, p. 72-73, 256, 258-262.

Procedures and equipment using two 5-ton electric-arc melting furnaces. (To be concluded.)

14B-19. Patterns and Molding Methods for Steel Castings. IV. John Howe Hall. *Foundry,* v. 77, Feb. 1949, p. 90-93, 210, 214, 216, 219-220, 222.

Use of all-core assemblies and molding practice with skeleton patterns. (To be concluded.)

14B-20. Roll Founding. W. G. Scott. *Foundry Trade Journal,* v. 86, Jan. 20, 1949, p. 47-53; Jan. 27, 1949, p. 77-79.

Details of procedure for casting large units.

14B-21. Stahlhohlguss als Vormaterial. (Hollow Steel Castings as Semi-Finished Products.) Karl Simoneit and Wilhelm Rädeker. *Stahl und Eisen,* v. 68, Nov. 4, 1948, p. 419-426.

The casting of ingots in stationary molds and the centrifugal casting of hollow ingots. Methods are critically evaluated and applications for centrifugally cast ingots are indicated.

14B-22. Elaboration d'une fonte mécanique facilement usinable. (Development of a Highly Machinable Cast Iron for Machine Parts.) Gabriel Joly. *Fonderie,* Nov. 1948, p. 1389-1391.

Composition and method of production; mechanical properties.

14C—Nonferrous

14C-6. Centrifugal Pressure Casting. Robert R. Myers. *Printing Equipment Engineer,* v. 77, Jan. 1949, p. 17-21.

Producing electrotype and stereotype curved printing plates using plastic molds followed by electrodeposition of a copper shell and casting of the plate.

14C-7. Modern Foundry Methods. *American Foundryman,* v. 15, Jan. 1949, p. 52-54. Based on paper by H. W. Bennett.

Picture story briefly describes molding of a one-piece bronze turbine-runner model casting.

14C-8. Economical Die Production. B. Baldock. *Machinery* (London), v. 74, Jan. 27, 1949, p. 117-118.

Die-casting dies in which die steels are largely replaced by cast iron.

14C-9. Die-Casting Practice and Technique. IV. Calculating Weights From Drawings. W. M. Halliday. *Metal Industry,* v. 74, Jan. 28, 1949, p. 63-65, 72.

Method by which the weight of a die casting is directly determined by calculation from drawings or blueprints.

14C-10. Casting Masters. *Esso Oilways,* v. 15, Feb. 1949, p. 1-9.

Advantages of die-cast parts over those formed in sand molds. Die-casting machines.

14C-11. Die Casting Die Design. Part II. (Continued.) H. K. Barton and James L. Erickson. *Tool & Die Journal,* v. 14, Feb. 1949, p. 57-58, 60-61, 78, 80.

Relative merits of hand and hydraulically operated cores. Other features of cores and core blocks. (To be continued.)

14C-12. Making the Trial Run on Die Casting Dies. James L. Erickson. *Tool Engineer,* v. 22, Feb. 1949, p. 24-25.

Recommended procedures.

14D—Light Metals

14D-9. Die Casting Aluminum and Magnesium Alloys. Part 2. Selecting the Aluminum or Magnesium Die-Casting Alloy. *Modern Metals,* v. 4, Jan. 1949, p. 18-21. Reprinted from book recently published by Aluminum Co. of America.

Selection of the proper light alloy, desired properties, commonly used alloys and their analysis, allowable impurities, corrosion resistance, mechanical properties, and physical properties of Al and Mg.

14D-10. The Antioch Process of Metal Casting. E. A. Canning. *Foundry,* v. 77, Feb. 1949, p. 74-77, 230, 232, 234.

Previously abstracted from *SAE Journal.* (See item 14D-4, 1949.)

14D-11. Zur Frage der Verbesserung der Anschnitt- und Formtechnik bei Leichtmetallguss. (The Problem of Improving Gating and Molding Techniques in Light-Metal Casting.) G. Seumel. *Metall,* June 1948, p. 185-188.

Experiments with Silumin and beta-Silumin alloys.

14D-12. Comparison of Common Aluminum Casting Alloys. Robert S. Burpo, Jr. *Materials & Methods,* v. 29, Feb. 1949, p. 85, 87.

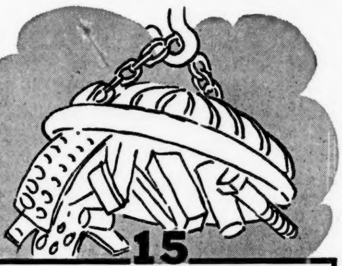
A tabular presentation of compositions, types of casting for which suitable, characteristics and uses, and standard specifications.

14D-13. Moulage en coquille par gravité des alliages d'Aluminium. (Gravity Chill Casting of Aluminum Al-

loys.) Jean Duport. *Fonderie,* Nov. 1948, p. 1371-1388.

Comparison with other methods of casting commonly used in France. Advantages and disadvantages; a series of practical hints.

For additional annotations indexed in other sections, see: 12-23; 16C-6; 19C-5



SCRAP and BYPRODUCT UTILIZATION

15-8. Dry Lime Treatment of Waste Pickle Liquor. C. J. Lewis. *Iron Age,* v. 163, Jan. 20, 1949, p. 48-53.

A method of accomplishing disposal, without lagooning. The process employs dry-lime procedures for production of quick-settling sludges which dewater at practical rates on vacuum filters or centrifuges. Lime-slacking or lime-slurrying equipment is not required.

15-9. Scrap Steel Turnings; A Simple Method of Concentration. Edmund R. Thews. *Iron and Steel,* v. 22, Jan. 1949, p. 25-26.

A practical but unscientific method suggested where chipping and baling are uneconomic. The method consists essentially of placing the turnings in a furnace and building a fire under them. The finer material burns supplying heat which melts down the larger pieces, producing material suitable for charging.

15-10. Reclaiming Tin From Residues. A. G. Arend. *Mine & Quarry Engineering,* v. 15, Jan. 1949, p. 23-26.

Procedures and equipment. Flow sheets for reclamation from low and high-grade scrap materials and smelting residues.

15-11. Process Revision Gives Low-Cost Waste Disposal. C. F. Hauck and L. C. Bishop. *Chemical Industries,* v. 64, Jan. 1949, p. 47.

Procedures for disposal of oils, pickle liquors, and cyanide-containing wastes.

15-12. Secondary Metals Now Accepted as of High Quality. Kenneth Rose. *Materials & Methods,* v. 29, Jan. 1949, p. 56-59.

Properties of scrap steel, Al, Cu, Zn, Pb, and Ni as compared with primary metals. These metals are usually satisfactory for any normal application.

15-13. Aluminium Recovery From Scrap Aircraft. *Engineer,* v. 186, Dec. 31, 1948, p. 684-685.

British techniques. Diagrams of special furnaces for handling contaminated scrap.

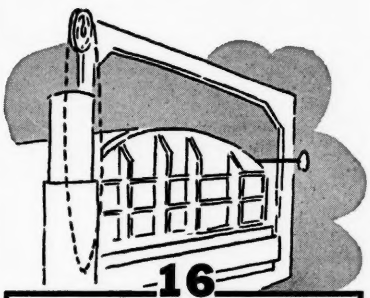
15-14. The Treatment of Plating and Pickling Shop Wastes. E. W. Mulcahy. *Journal of the Electrodepositors' Technical Society,* v. 22, 1946-47, p. 227-242; discussion, p. 267-268.

Methods of neutralizing acid from waste liquors and rinse water; precipitation of Cr, Cu, Fe; removal of cyanide in effluents; construction of effluent-treatment tanks of suitable acidproof materials; measurement of flow and pH recording apparatus; removal and scrubbing of nitrous oxide fumes from bright-dipping plants; intake-air velocity on extractors; hard rubber as lining for tanks and fan casings; recovery of waste pickle liquors from industrial pickling plants; plant for crystallization of ferrous sulfate.

15-15. (Book). **The Waste Trades Annual and Directory.** 346 pages. British-Continental Trade Press, Ltd., Suite 1508, 225 W. 34th St., New York City. $5.00.

Information on scrap and waste handling. Lists firms from all countries trading in scrap metals, rubber, paper, and other materials. United Kingdom Waste Materials Regulations are included.

For additional annotations indexed in other sections, see: 14B-18; 16C-7



FURNACES and HEATING DEVICES

16A—General

16A-14. Calculation of the Electrical Resistance of the Channel of an Induction Furnace With an Iron Core. (In Russian.) P. F. Sabaneev. *Promyshlennaya Energetika* (Industrial Power), v. 5, Oct. 1948, p. 8-10.

A newly developed formula. Methods of application and calculation are illustrated by two sample determinations.

16A-15. Safe Operating Procedures for Different Types of Special Atmospheric Furnaces. C. George Segeler. *Industrial Heating,* v. 16, Jan. 1949, p. 58, 60, 62, 64.

Special furnace atmospheres, both combustible and non-combustible types; instrumentation; starting, operating, and shutting-down procedures; toxic-gas hazards.

16A-16. Protective Atmospheres in Industry. Part III. A. G. Hotchkiss and H. M. Webber. *General Electric Review,* v. 52, Feb. 1949, p. 37-44.

Atmospheres for preventing oxidation or reducing oxides, with emphasis on uses and properties, costs, and methods of manufacture and distribution. (To be continued.)

16A-17. (Book). **Le Chauffage Haute Frequence.** (High-Frequency Heating.) G. Henry-Bezy. 130 pages. Dunod, 92, Rue Bonaparte, Paris 6, France.

One section deals with dielectric heating (heating of nonconductors); and the other with induction heating (heating of conductors). Numerous applications; advantages over other heating methods. Use of radio frequencies.

16B—Ferrous

16B-10. Coke Oven Expansion and Blast Furnace Operation in 1948. Charles Longenecker. *Blast Furnace and Steel Plant,* v. 37, Jan. 1949, p. 67-70.

New installations and technological developments.

16B-11. Soaking Pits; Some Experiences With Firing and Control. H. V. Flagg. *Iron and Steel,* v. 22, Jan. 1949, p. 33-36.

Experiences at Armco's Middletown, Ohio, plant since 1928.

16B-12. Investigation by Models of a System Involving Radiation, Fusion and Gas Flow. M. W. Thring. *Research,* v. 2, Jan. 1949, p. 36-42.

Two models of the openhearth heat-flow system are described, one corresponding to diffusion-combustion of luminous flames whose radiation peak shifts according to the relation between the ratio of the heat radiated to the heat input and the mixing length; and the other corresponding to heating and melting by radiation from above a pile of irregularly shaped solids which sink in their own melt. 16 ref.

16B-13. Versatility of Induction Heating Exploited in Producing Tractor Parts. J. D. Graham, H. F. Kincaid, and R. E. McGee. *Steel,* v. 124, Jan. 31, 1949, p. 62-64, 80.

Equipment and procedures used in heating for forging, hardening, tempering, brazing, soldering, and shrinking at International Harvester's new Louisville plant.

16B-14. Design Suggests Means for Reducing Time of Open-Hearth Heats. *Steel,* v. 124, Jan. 31, 1949, p. 68, 71.

A movable roof section permits rapid charging of scrap, and a pouring nozzle built into the furnace bottom permits tapping the heat directly into molds, casting machine, or ladles.

16B-15. Heating and Treatment of Alloy Steels. A. H. Arbogast and M. K. Morris. *Iron and Steel Engineer,* v. 26, Jan. 1949, p. 75-78; discussion, p. 78-81.

New toolsteel annealing furnaces that use, on the average, a mixture of 6000 cu. ft. of nitrogen and 315 cu. ft. of propane. The fuel rate is 300 lb. of bituminous coal per ton of steel; no decarburization occurs, and carburization does not exceed 0.005 in. on a side.

16B-16. Fast Open Hearth Charging. *Iron and Steel Engineer,* v. 26, Jan. 1949, p. 126-127.

See abstract from *Steel,* item 16B-14, 1949.

16B-17. Forging Furnace Handles Variety of Steels With Minimum of Scale. *Industrial Heating,* v. 16, Jan. 1949, p. 66, 68.

Slot furnace recently installed at Steel Improvement and Forge Co.

16B-18. The Production of Sheet Steel Modernized at Irvin Works by Carnegie-Illinois. *Industrial Heating,* v. 16, Jan. 1949, p. 70-74, 76, 78, 80, 138, 140.

Major additions to steel-producing facilities, including furnaces, conveyors, shearing equipment, pickling equipment, and handling equipment.

16B-19. Heating for Hardening and Forging With RF Equipment. Thomas E. Lloyd. *Iron Age,* v. 163, Feb. 17, 1949, p. 86-92.

Economies resulting from the use of induction heating for heating forging billets and for heat treating of parts.

16B-20. A Combined Carburizing and Nitriding Furnace. I. J. Lomas. *British Steelmaker,* v. 15, Jan. 1949, p. 33-36.

16C—Nonferrous

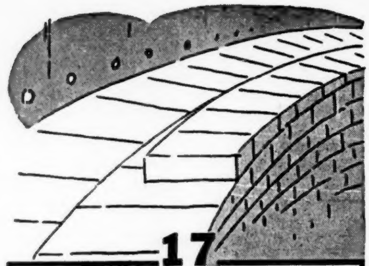
16C-6. Bronze Foundry Realizes Savings by Modernizing Melting Furnaces. Paul R. Hesse and Bruce Schafer. *Iron Age,* v. 163, Feb. 3, 1949, p. 122-124.

Program of modernization of three electric rocking furnaces resulted in savings of $1.23 a ton, and other benefits. Installation of automatic electrode controls, conical shells, and mechanical overtravel stops.

16C-7. Development of Muffle Furnaces for the Production of Zinc Oxide and Zinc at East Chicago, Indiana. Gunnard E. Johnson. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 118-124.

Development of an experimental and a commercial muffle furnace for treatment of Zn-base die-cast scrap for the production of zinc oxide and zinc. Details of construction; yields and compositions of products.

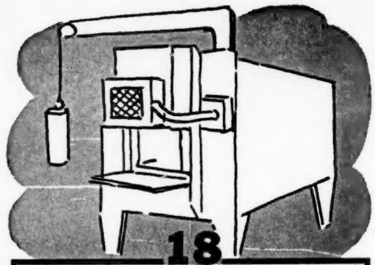
For additional annotations indexed in other sections, see:
2B-25; 14A-15; 14B-12; 15-13; 18A-2



17 REFRACTORIES and FURNACE MATERIALS

17-10. The Preparation of Laboratory Ware in Beryllia by Slip Casting. A. R. Edwards and F. Henderson. Division of Aeronautics, Council for Scientific and Industrial Research (Melbourne, Australia), S and M Note 174, Nov. 1948, 12 pages.

Method for preparation of the above for experimental work with high-temperature alloys. Method features noncritical nature of various processes involved.



18 HEAT TREATMENT

18A—General

18A-2. Gas Generators for Controlled Atmospheres. W. H. Holcroft and M. R. Larson. *Steel,* v. 124, Jan. 24, 1949, p. 54-55.

18A-3. Chemical Analysis of Heat Treating Salts. Part II. (Concluded.) Vincent C. Petrillo. *Steel Processing,* v. 35, Jan. 1949, p. 37-43.

Methods developed for chemically determining fluorides qualitatively in Classes A, B, and C salt-bath mixtures, and pH ranges, moisture and sulfates in all four classes. Class A consists of potassium nitrate, sodium nitrite, and sodium nitrate; B, of potassium nitrate and sodium nitrate; C, of sodium chloride and potassium chloride; and D, of barium chloride and silica. 11 ref.

18A-4. Heat-Treating Department Planned for Quality Control and Cleanliness. John H. Fisher. *Machinery* (American), v. 55, Feb. 1949, p. 166-169.

Department at Landis Tool Co., Waynesboro, Pa.

18B—Ferrous

18B-15. Induction Hardening Mill Rolls. *Iron Age,* v. 163, Jan. 27, 1949, p. 71. Based on article by G. W. Seulen and H. Kuhlbars, *Iron and Coal Trades Review.*

Methods for application of surface hardening by induction heating to rolls up to 8 in. diam. and 12 in. long. The methods are total surface heating and a scanning or feed method. The scanning method is used for rolls of larger diameters.

18B-16. Predicting Carbon Penetration Curves in Carburizing. A. G. Guy. *Iron Age,* v. 163, Jan. 27, 1949, p. 74-76.

A simple method for calculating the above, employing solubility and diffusion data. It is claimed to be sufficiently accurate for practical use.

18B-17. Martempering. R. H. Aborn. *Metal Progress,* v. 55, Jan. 1949, p. 65-73.

Limitations and results of martempering carbon and low-alloy steels. Specific information about distortion, cracking, and the maximum size of bar that can be hardened by martempering.

18B-18. Discussion on Papers: Symposium on the Peeling of Whiteheart Malleable Cast Iron. *Journal of the Iron and Steel Institute,* v. 161, Jan. 1949, p. 17-34.

Discussion of papers published in Jan. 1948 and Nov. 1947 issues of *Journal of the Iron and Steel Institute.* (See items 18b-1, 18b-19, 18b-20 and 18b-21, 1948.)

18B-19. How to Quench Tool and Die Steels. Peter Payson. *Machinery* (American), v. 55, Feb. 1949, p. 177-181.

Recommended quenching schedules, derived on the basis of transformation curves for the various types.

18B-20. Induction Hardening Automobile Parts. William J. Harris. *Steel,* v. 124, Feb. 7, 1949, p. 90-91, 128, 130.
Equipment and procedures used at Studebaker.

18B-21. Heat-Treatment in a Magnetic Field. J. Ferdinand Kayser. *Metal Treatment and Drop Forging,* v. 15, Winter 1948-9, p. 193-194.
Reviews literature. Refers only to ferromagnetic substances.

18B-22. Induction Hardening Increases Wear Life of Cast Iron Parts. H. R. Clauser. *Materials & Methods,* v. 29, Feb. 1949, p. 48-52.
A number of applications show that cast irons can be successfully induction hardened to give improved performance.

18B-23. Tools and Dies Bright Hardened and Brazed in New One-Step Process. Samuel Damon and A. L. Pranses. *Materials & Methods,* v. 29, Feb. 1949, p. 58-61.
Repair or modification of tools and dies as well as fabrication of new ones can be accomplished by a simultaneous brazing and heat treating technique for air hardening toolsteels.

18B-24. Selective Hardening of Dynaflow Transmission Parts. *Automotive Industries,* v. 100, Feb. 1, 1949, p. 33, 82.
Equipment and procedures.

18B-25. Continuous Flame Hardening Speeds Chain Production. *Industrial Heating,* v. 16, Jan. 1949, p. 48, 50, 52, 56.
Procedures and equipment.

18B-26. Practical Pointers on Steel Treating, Part II. W. R. Bennett. *Modern Machine Shop,* v. 21, Feb. 1949, p. 112-114, 116, 118, 120, 122, 124, 126, 128.
Design of tools and dies, hard spots in annealed bars, furnaces and their applications, and a new furnace for heating steel. The homemade heat-treating furnace described is so built that a CO atmosphere can be generated within its chamber merely by dropping in a piece of charcoal at the beginning of each heat. With this furnace it was possible to heat treat straight-carbon; Mo; Mn oil-hardening; tungsten high-speed; and high-C, high-Cr steels without development of scale, soft exteriors, carburization, or decarburization.

18B-27. Infrared Installation Used for Stress Relieving Springs. *Modern Machine Shop,* v. 21, Feb. 1949, p. 190, 192, 194.

18B-28. An Analysis of Nitriding. Howard E. Boyer. *Iron Age,* v. 163, Feb. 10, 1949, p. 68-74; Feb. 17, 1949, p. 93-98.
The status of nitriding as a competitive method. Part I: Surface-hardness data, comparing various commercial steels with specific nitriding grades; correlation with structural studies and the metallurgical factors involved. Part 11: the austenitic stainless and other steels; nitriding equipment, proper applications, precautions, and economic aspects.

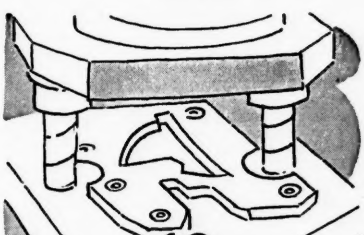
18B-29. Heat Treatment of Forgings and Die Blocks at A. Finkl & Sons Co.: II. Heat Treat Plant No. 2. *Industrial Heating,* v. 16, Jan. 1949, p. 42-44, 46, 134.
(To be continued.)

18B-30. Mechanized Flame Hardening. J. R. Burg. *Machine Design,* v. 21, Feb. 1949, p. 132-134.
Typical machines of three basic types.

18B-31. Field Stress Relief of Vessels by Radiant Electric Heating. Milton Ludwig. *Petroleum Refiner,* v. 28, Feb. 1949, p. 109-111.
A new approach to an old problem. Simple method gives promise of wide application to typical cases encountered in process plants. Refers to stress relief of welded vessels.

18B-32. Designing for High-Frequency Induction Hardening. J. T. Temin. *Transactions of the American Society of Mechanical Engineers,* v. 71, Feb. 1949, p. 135-144; discussion, p. 144-146.
Design principles. Special fixtures and machines which have been developed for a variety of applications. Metallurgical aspects of the induction hardening process.

For additional annotations indexed in other sections, see:
3A-39; 3B-21; 4D-13; 7B-20; 16B-15-20; 19A-36; 20B-14; 22B-54; 23B-6



19 WORKING

19A—General

19A-17. Ultra-Depth Drawing of Sheet Stock. Frank Charity. *Modern Industrial Press,* v. 11, Jan. 1949, p. 6, 8, 51-52.
Draws as deep as 9 in. have been produced in a single press operation from alloys such as 2S-0, 3S-0, and 3S-½H without special dies or preheating. Such operations are made possible by use of a new-type petroleum-base lubricant.

19A-18. Designing of "Trouble-Free" Dies. Part LXXXIX. Types of Presses, Their Uses and Capacities. C. W. Hinman. *Modern Industrial Press,* v. 11, Jan. 1949, p. 20.
Hydraulic drawing presses of different types.

19A-19. Speedy Airplane Sub-Contracting at Sulak Manufacturing Co. Howward E. Jackson. *Modern Industrial Press,* v. 11, Jan. 1949, p. 48, 50.
Press and machining operations in manufacture of small parts.

19A-20. Eliminating Defects Through Improved Rolling Methods. J. A. Tischbein. *Iron and Steel Engineer,* v. 26, Jan. 1949, p. 57-62; discussion, p. 62-65.
How changing pass design and procedure reduces defects due to seams, and increases tonnage and yield of rolled steel products.

19A-21. An Investigation Into the Inhomogeneity of Deformation in Wire Drawing and Rolling. June Collins and R. W. K. Honeycombe. *Journal of the Council for Scientific and Industrial Research,* v. 21, Feb. 1948, p. 59-68. (Reprint.)
A method involving microscopic detection of the beginning of recrystallization in deformed metals.

19A-22. Bibliography on Wire. *Library and Information Dept., Iron and Steel Institute* (London), Bibliographical Series No. 13, 1947, 146 pages.
Manufacture, treatment, and properties, including cold-drawing of bars.

19A-23. Wire-Drawing With Continuous Drawing Machines. S. Geleji. *Wire Industry,* v. 16, Jan. 1949, p. 53-56.
Mathematics of the above; descriptions of equipment.

19A-24. Hints for Eliminating Die Failures. S. A. Phelps. *Machinery* (London), v. 74, Jan. 13, 1949, p. 48-49.
Thirty-one recommendations for punch and die design.

19A-25. Wire-Drawing Compounds. Properties Desired—Function—Methods of Application. E. L. H. Bastian. *Metal Industry,* v. 74, Jan. 14, 1949, p. 31-33. A condensation.

19A-26. The Calculation of Stresses in the Ironing of Metal Cups. R. Hill. *Journal of the Iron and Steel Institute,* v. 161, Jan. 1949, p. 41-44.
A theory of the stresses required to iron a cup by forcing it through a die with a close-fitting internal punch. The ironing load is evaluated for a practical range of reductions and die angles. Friction and work-hardening are considered

19A-27. Trimming Cast Parts. Arthur H. Allen. *Foundry,* v. 77, Feb. 1949, p. 84-86.
Use of punch presses for the above at Ford Motor Co.

19A-28. Certain Possibilities of Increase of Productivity and Decrease of Defects During Cold Rolling. (In Russian.) V. I. Beloshabskii. *Promyshlennaya Energetika* (Industrial Power), v. 5, Oct. 1948, p. 11-13.
A new electrical device for maintaining constant tension of the formed strip. Electrical circuit diagrams and performance curves.

19A-29. The Routine Checking of Crank Presses. K. L. Jackson. *Sheet Metal Industries,* v. 25, July 1948, p. 1353-1354.
Recommended procedures.

19A-30. Some Fundamental Considerations Relating to the Deep Drawing of Metals. A. R. E. Singer. *Sheet Metal Industries,* v. 25, July 1948, p. 1387-1393, 1400.
Previously abstracted from *Steel Processing.* See items 19a-234 and 19a-248, 1948.

19A-31. Manufacturing Methods Used for the Quantity Production of the Cookson Lock Joint. J. B. Clegg. *Sheet Metal Industries,* v. 25, Aug. 1948, p. 1585-1591, 1614.
Forming methods used for large-scale production of the above. Mathematics of pattern development. Use in assembly of finished products.

19A-32. A Practical Workshop System for the Care and Maintenance of Press Tools. (Continued.) W. M. Halliday. *Sheet Metal Industries,* v. 25, Aug. 1948, p. 1592-1600; Dec. 1948, p. 2421-2427.
Aug: punch guidance by stripper plate, pillar-type press tools, top punch plate bushings, design and fixture of guide pillars, punch misalignments due to faulty punching, application of "shear" to punch and die, forms of "shear", and maintenance requirements of "shear" tools. Dec.: piercing tools, their design, and maintenance requirements. (To be continued.)

19A-33. The Application of Deep Drawing and Pressing to Gas Turbine Engines. H. E. Lardge. *Sheet Metal Industries,* v. 25, Aug. 1948, p. 1603-1608.
Components produced using mild steel; 18-8 stainless; and an 80% Ni, 20% Cr alloy.

19A-34. Cold Rolling Technique. I. Explanation of Terms and Theories Used in the Literature of Rolling. II. The Effect of Speed on Cold Rolling Practice. Hugh Ford. *Sheet Metal Industries,* v. 25, July 1948, p. 1327-1336,

1344; Aug. 1948, p. 1545-1549; Sept. 1948, p. 1757-1762; Oct. 1948, p. 1973-1978; Nov. 1948, p. 2189-2197; Dec. 1948, p. 2405-2411, 2418.

Part I, July and Aug., explains terms and theories and gives a glossary. Part II concluded with Dec., deals with effect of speed on gage; effect of speed on production; effect of speed on roll force and power consumption; and a general discussion of the cause of the speed effect. (To be continued.)

19A-35. Cold Rolling Technique. III. The Effect of Strip Tension on Mill Power. Hugh Ford. *Sheet Metal Industries,* v. 26, Jan. 1949, p. 81-86; Feb. 1949, p. 315-318.

Jan.: Energy of deformation and total mill power; estimation of power consumption on the basis of theory; sample calculation. Feb.: Experimental results for power consumption in rolling with tension.

19A-36. Notes on Metalworking and Heat Treatment in 1948. R. T. Willson. *Steel Processing,* v. 35, Jan. 1949, p. 19-20, 26.

New developments in equipment for working and heat treatment.

19A-37. Carbide Die Construction. *Steel Processing,* v. 35, Jan. 1949, p. 21-23.

Designs for various operations in the stamping, forming, and drawing of metals.

19A-38. Factors in Selecting a Drawing Lubricant. R. F. Johnston. *Steel Processing,* v. 35, Jan. 1949, p. 27-30, 43.

Advantages of graphite.

19A-39. Extrusion Press Mandrels. H. Assmann. *Metal Industry,* v. 74, Jan. 21, 1949, p. 46-50; Jan. 28, 1949, p. 69-72. Translated and condensed from *Metall,* April 1948, p. 106-114; May 1948, p. 153-157.

Previously abstracted from original. See item 19A-10, 1949.

19A-40. Forming and Closing Tube Ends by a New Process. Arthur L. Williams. *Machinery* (American), v. 55, Feb. 1949, p. 158-161.

Tubular products can be formed to various cross-sections and their ends closed at high production rates and low cost by a process in which heat is applied to the work during forming by the passage of electric current and the resistance so developed. The process can be applied to practically any metal that will conduct electrical current.

19A-41. Coining Die With Automatic Feed. Edwin Mosthaf. *Machinery* (American), v. 55, Feb. 1949, p. 199-200.

Die capable of forming 3600 washers an hour.

19A-42. Progressive Piercing, Punching, and Forming Dies. (Concluded.) Charles R. Cory. *Machinery* (American), v. 55, Feb. 1949, p. 188-193.

Multiple progressive dies; dies for producing parts of intricate shape; coil-feed drawing and blanking dies.

19A-43. Die Design for Symmetrical Brackets. Part III. (Concluded.) Hans Effgen. *Tool & Die Journal,* v. 14, Feb. 1949, p. 51-52, 54-55.

A die which produces a bracket with bends in two directions, the bends being made simultaneously. Good practice in the construction and manufacture of dies.

19A-44. Press Brake Tooling for Piercing and Notching. Ralph Weisbeck. *Tool & Die Journal,* v. 14, Feb. 1949, p. 44, 46-48, 50.

Equipment and procedures.

19A-45. Carbide Dies Set Production Records. A. Earle Glen. *American Machinist,* v. 93, Feb. 10, 1949, p. 85-88.

Various applications to sheet-metal press work. A million hits per grind is not uncommon with carbide die sets, and life expectancy is usually 20-60 times that of steel dies.

19A-46. Kaiser-Frazer's Expanded Press Shop at Willow Run. *Automotive Industries,* v. 100, Feb. 1, 1949, p. 43, 78.

19A-47. Fundamental Principles of Drawing Dies. C. W. Hinman. *Machine and Tool Blue Book,* v. 45, Feb. 1949, p. 121-124, 126, 128-130, 132.

The size of drawing radii, drawing without a blankholder, drawing concave and tapered shells, how to design drawing dies, and stresses in drawing metals. (First of a series.)

19A-48. Rolls and Rolling. E. E. Brayshaw. *Blast Furnace and Steel Plant,* v. 37, Jan. 1949, p. 81-84.

Various types of passes. (First of a series.)

19A-49. Practical Problems of Light Presswork Production. (Continued.) J. A. Grainger. *Sheet Metal Industries,* v. 25, July 1948, p. 1347-1352, 1354; Aug. 1948, p. 1561-1568; Sept. 1948, p. 1771-1775; Nov. 1948, p. 2201-2205; v. 26, Jan. 1949, p. 98-102.

July: general methods and equipment; Aug.: materials in common use and specific information on the drawing of mild-steel sheet and terneplate; types of defects in sheet steel; Sept.: equipment for rolling and annealing brass strip; Nov.: operations on copper and tinplate; defects in materials; Jan.: defects and the need for a reliable test for drawability and for standardization of techniques. (To be continued.)

19A-50. Shot Peening; A Survey of Modern Methods and Applications. G. T. Colegate. *Sheet Metal Industries,* v. 26, Jan. 1949, p. 141-148, 152; Feb. 1949, p. 371-381.

Jan.: Nature of fatigue failure of metals and mechanism of shot peening. Development of the process; the shot used; equipment; and procedures. Feb.: Factors affecting intensity of peening; effect of tempering after shot peening; measurement of peening intensity; interpretation of test results; peening methods and equipment; miscellaneous applications to ferrous and nonferrous metals. 20 ref.

19A-51. Modifications to Piercing Dies to Improve Stripping. *Sheet Metal Industries,* v. 26, Feb. 1949, p. 325-330.

On piercing-type press tools, considerable difficulties and production delays are often encountered because of the tendency of slugs to stick to the end of the punch. recommended modifications.

19A-52. Rilievo delle tensioni interne in un anello a parete spessa col metodo dell'asportazione. (Relief of Residual Stresses in a Thick-Walled Ring by Mechanical Working.) Andrea Ferro. *La Metallurgia Italiana,* v. 40, Nov.-Dec. 1948, p. 233-237.

A theoretical analysis of above problem. Equations and numerical coefficients are proposed.

19B—Ferrous

19B-20. Electrical Developments in the Steel Industry—1948. H. W. Poole. *Blast Furnace and Steel Plant,* v. 37, Jan. 1949, p. 77-80.

The magnetic amplifier; blooming and slabbing mills; hot strip mills; tandem cold strip mills; temper-pass mills; induction heating; and miscellaneous other developments.

19B-21. Twin Coach Plant in Buffalo Makes Rapid Strides. Walter Rudolph. *Modern Industrial Press,* v. 11, Jan. 1949, p. 28, 32, 34, 36.

Manufacture of bus bodies, press operations, welding, riveting, and assembly.

19B-22. Electric Motors Over Three Hundred Horsepower Applied to Main Roll Drives in the Iron and Steel and Allied Industries During 1948. *Iron and Steel Engineer,* v. 26, Jan. 1949, p. 118-119.

A tabulation.

19B-23. New Hot Strip Mill in Operation at Superior Steel Corp. *Iron and Steel Engineer,* v. 26, Jan. 1949, p. 134-135.

19B-24. Low-Alloy High-Tensile Steels for Automotive Structures. C. L. Altenburger. *SAE Quarterly Transactions,* v. 3, Jan. 1949, p. 145-155.

Previously abstracted from condensed version in *SAE Journal.* (See item 19b-94, 1948.)

19B-25. Modern Manufacturing Methods for the Production of Steel Sheets. H. H. Stanley. *Sheet Metal Industries,* v. 25, Aug. 1948, p. 1537-1544, 1558.

Various methods and equipment and their respective merits.

19B-26. Metal Container Manufacture; A Review of Some Modern Production Methods. *Sheet Metal Industries,* v. 25, Oct. 1948, p. 1981-1988; Nov. 1948, p. 2206-2207.

Printing; slitting or guillotining; rolling, body forming or pressing; flanging; side seaming or end seaming; soldering or doping; wet testing; assembling and packing.

19D-27. Impact Extrusion; Some Preliminary Results of a Recent Research. Richard Hanes. *Sheet Metal Industries,* v. 26, Jan. 1949, p. 89-97, 102.

Applications and advantages. The work described was done with aluminum.

19B-28. The Application of Phosphate Coatings to Wire, Tube and Deep Drawing. H. A. Holden and S. J. Scouse. *Sheet Metal Industries,* v. 26, Jan. 1949, p. 123-134, 136.

Properties of the coating, and applications for protection and as a lubricant for miscellaneous steel working processes. 14 ref.

19B-29. Upset Forgings. H. A. Whiteley. *Metal Treatment and Drop Forging,* v. 15, Winter 1948-9, p. 195-202.

Equipment, procedures, and applications.

19B-30. Bending Heavy Bars and Structural Shapes on Hydraulic Bulldozers. Charles H. Wick. *Machinery* (American), v. 55, Feb. 1949, p. 172-176.

Hydraulically operated bulldozers of 50 and 100 tons capacity are used to bend tubes, channels, bars, and other shapes as thick as 1 in.

19B-31. How Forging Acts to Enhance Metal Properties. E. O. Dixon and E. J. Foley. *Transactions of the American Society of Mechanical Engineers,* v. 71, Feb. 1949, p. 147-152.

Effect of the hot working method upon the physical properties of steel. Effect of hammer-forging for reductions of 0 to 96%, when open dies are used. In closed-die studies, billet material reduced 80 and 92% by rolling was used.

19C—Nonferrous

19C-3. The Flow of Metal in Tube Extrusion. C. Blazey, L. Broad, W. S. Gummer, and D. B. Thompson. *Journal of the Institute of Metals,* v. 75, Dec. 1948, p. 163-184.

Experiments by means of composite billets. The principal factor determining the type of flow is the degree to which the skin of the billet remains in place. In a non-lubricated container, there is sufficient friction between brass and Cu-Ni billets and the container wall to hold the skin in place, but with Cu the oxide envelope formed in preheating appears to function as a lubricant. In a lubricated container, brass and Cu-Ni flow like copper.

19C-4. Modern Methods and Techniques Are Employed in Brass Rod Fabrication. *Copper & Brass Bulletin,* Feb. 1949, p. 2-5.
Production by the hot extrusion process.

19C-5. New Beryllium Copper Molds. Frank Charity. *Modern Machine Shop,* v. 21, Feb. 1949, p. 174, 176, 178, 180.
Molding process which features the combined use of hobbing, casting, and press-forging operations.

19D—Light Metals

19D-10. Aluminum Alloy Shearing Performed at Line Speed of 300 Feet per Minute. *Steel,* v. 124, Jan. 24, 1949, p. 64.
Use of Talbot type flying sheet shear at Youngstown plant of United Engineering and Foundry Co.

19D-11. "One-Piece Aluminum Boat"—Mass Produced by Reynolds Metals Company. P. D. Aird. *Modern Industrial Press,* v. 11, Jan. 1949, p. 13-14, 18, 36.
Press, welding, and assembly operations.

19D-12. Press Users Conquer Fabrication Problems in Making New Magnesium Products. Floyd McKnight. *Modern Industrial Press,* v. 11, Jan. 1949, p. 22, 24, 26.
Miscellaneous press operations.

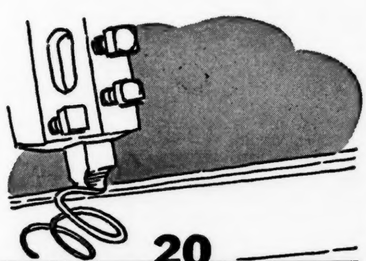
19D-13. Continuous, Quantity Production of Aluminum Luggage. Fred M. Burt. *Modern Industrial Press,* v. 11, Jan. 1949, p. 38, 40, 42, 46.
Press operations, heat treating, machining, finishing, and assembly.

19D-14. Permanente Continues Northwest Growth. *Western Metals,* v. 7, Jan. 1949, p. 25-26.
Procedures and equipment of Permanente's aluminum sheet mill at Trentwood, Wash.

19D-15. The Alloys Appropriate to Wire Manufacture. D. C. G. Lees. *Wire Industry,* v. 16, Jan. 1949, p. 45-47; discussion, p. 47.
Aluminum alloys suitable for the above.

19D-16. General Notes on Aluminum Presswork. X. J. W. Lengbridge. *Tool Engineer,* v. 22, Feb. 1949, p. 34-37.
Drawing speeds, lubrication, and methods of calculation of blank size for different shaped shells.

For additional annotations indexed in other sections, see:
4C-18-25; 8-32; 22D-8; 24A-18



20 MACHINING and MACHINABILITY

20A—General

20A-44. Adjustable Fixture Increases Utility of Special Purpose Machine. Thomas E. Lloyd. *Iron Age,* v. 163, Jan. 20, 1949, p. 61-65.
By use of a two-station fixturing arrangement with adjustable hold-down clamps, locating devices, and replaceable vertical and horizontal positioning pins, a special purpose machine is utilized in drilling and boring 76 different sizes and shapes of bell housings. Construction details, typical tool sizes and spindle speeds for boring and drilling, and some of the parts machined by it.

20A-45. Maintenance in Oil Refineries. Harvey S. Peters. *Western Machinery and Steel World,* v. 40, Jan. 1949, p. 74-77, 95.
Miscellaneous machine-shop operations.

20A-46. Automatic Profiling. Gordon B. Ashmead. *Western Machinery and Steel World,* v. 40, Jan. 1949, p. 92-93.
The "Pro-Turner", a profiling attachment which can be used on engine lathes, turrets, boring mills, planers, or precision horizontal boring machines.

20A-47. Man-Au-Trol for Mass Production. *Western Machinery and Steel World,* v. 40, Jan. 1949, p. 101.
Use of 36-in. Bullard "Man-Au-Trol" vertical turret lathe, primarily in machining the stators and end shields of electric motors.

20A-48. Computing Steps of Straight Form Tools. S. H. Balderson. *American Machinist,* v. 93, Jan. 29, 1949, p. 263.
Calculations are illustrated by a diagram.

20A-49. Planing With Carbides. *American Machinist,* v. 93, Jan. 29, 1949, p. 265, 267.
Information is given in the form of text, tables, and diagrams.

20A-50. Sharpening Cemented Carbide Tools With Silicon Carbide Wheels. J. C. Arndt. *Automotive Industries,* v. 100, Jan. 15, 1949, p. 46, 80, 82.
Recommended procedures.

20A-51. An Unusual Cam Milling Fixture. Robert Mawson. *Iron Age,* v. 163, Jan. 27, 1949, p. 66-67.
Use for accurate and low-cost work.

20A-52. Practical Problems of Machinability. (Continued.) Chester M. Inman. *Metals Review,* v. 22, Jan. 1949, p. 16-17.
Reasons for dulling or failure of cutting tools and means for minimizing them.

20A-53. Tapped Holes for Screws and Studs. D. S. Stoneman. *Fasteners,* v. 5, no. 3, [1948], p. 10-13.
Successful tapping, although not difficult, involves careful consideration of the tapping machine, the tap, hole preparation, and speeds and lubricants to be used.

20A-54. Investigation of Plate Filters of Lubricating and Hydraulic Systems Used on Machine Tools. (In Russian.) A. Ya. Lopato. *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Oct. 1948, p. 10-14.
Factors influencing dissociation, oxidation, contamination, and irrigation of coolants used in machining were investigated. Criteria of selection of filtration system and methods of design of filters.

20A-55. Anodic-Mechanical Grinding (Sharpening). (In Russian.) S. E. Noshov. *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Oct. 1948, p. 20-22.
Method consists in simultaneous electrolytic and mechanical action on the piece of metal to be ground or sharpened. The positive pole is connected to the object and the negative to the grinding disc, hardness of which can be many times less than that of the object to be ground. Details of the equipment, including electrical circuits.

20A-56. Influence of the Surface Activity of the Coolant on the Cutting Process and the Machinability of Metals. (In Russian.) N. A. Pleteneva and P. A. Rebinder. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 62, Oct. 1, 1948, p. 501-504.
Experimental data indicate that surface-active coolants not only decrease the external friction, but take part in the cutting process by facilitating deformation in the layers adjacent to those being cut.

20A-57. Precision Machining Costs Cut by Use of Portable Jig Boring Tool on Aircraft Parts. *Steel,* v. 124, Feb. 7, 1949, p. 104.

20A-58. Metal Cutting Fluids—Their Selection, Application and Maintenance. E. L. H. Bastian. *Iron Age,* v. 163, Feb. 10, 1949, p. 60-67.
A comprehensive review.

20A-59. Sharpening High-Speed Steel and Carbide-Tipped Hobs. Charles H. Wick. *Machinery* (American), v. 55, Feb. 1949, p. 149-157.

20A-60. Use and Care of Toolpost Grinders. J. F. Fischer. *Machinery* (American), v. 55, Feb. 1949, p. 184-187.
Application of toolpost grinders; selection of grinding wheels; and methods of adjusting grinding-wheel cutting action. (First of three articles.)

20A-61. Universal Boring-Bar for Turret Lathes or Radial Drilling Machines. Harold E. Murphey. *Machinery* (American), v. 55, Feb. 1949, p. 200-201.

20A-62. Scribing Tool for Circular Parts. H. Moore. *Machinery* (American), v. 55, Feb. 1949, p. 202.

20A-63. Lathe Fixture Bores to Exceptional Tolerances. R. W. Dayton and C. M. Allen. *American Machinist,* v. 93, Feb. 10, 1949, p. 89-91.
Boring technique in which accuracy is independent of the lathe. Test bearings 1¼-in. diam. are being made routinely to an accuracy of 0.00001-0.00002 in., and 4-in. bearings have been bored straight and round within 0.00003-0.00005 in. on standard machine-tool equipment. Principle involved is the support of an accurate cylindrical bar at four points and constraint of its motion to rotation and translation about its own axis.

20A-64. Air Clamps Unload Workers' Hands. J. V. Carlson. *American Machinist,* v. 93, Feb. 10, 1949, p. 92-93.
Various applications of air-operated fixtures to reduce over-all operation time in machine-shop work.

20A-65. Olds' V-8 Built With Ultra-Modern Tools. Chester S. Ricker. *American Machinist,* v. 93, Feb. 10, 1949, p. 94-97.
Machine-tool and inspection equipment and procedures.

20A-66. Practical Ideas. *American Machinist,* v. 93, Feb. 10, 1949, p. 120-124.
Includes the following: toolbar for machining long, thin slots (C.D. Mackinnon); use of countersunk plate and punch to form flat-head-screw dimple (S. D. Yarm); expansion of undersized threaded tubing by forcing balls through it (Sherman S. Cross); use of extra lead screw to guide threading tool (R. G. Dickens); self-aligning center punch (Charles E. Gray); simplified double-spline broach — inserted-teeth feature permits it to be made with ordinary tooling and setups on standard machines (G. R. Milner); use of two steadyrests for quick centering of long shafts (Lowell F. Stull); gage which aids in resetting boring-bar bits (Roger Isetts); and other miscellaneous shop hints.

20A-67. Smoothing Down Finishing Costs. *Applied Hydraulics,* v. 2, Feb. 1949, p. 16-18.
A surface-finishing machine operated by hydraulic and air circuits provides for both flat and adjustable contour movements. It is now

in use in the cutlery, hardware, hand tool, and industrial fields.

20A-68. Cutting Costs With a Portable, Precision Boring Machine. *Tool & Die Journal,* v. 14, Feb. 1949, p. 42-43.

Tool of simple design and construction, made up of relatively few parts. It turns out jobs to tolerances as close as ±0.00025 in.

20A-69. Toolmaking Aids for the Toolroom. Karl F. Kirchhofer. *Tool & Die Journal,* v. 14, Feb. 1949, p. 64-65, 68.

Combination angle plate and hole locater, height gage, adjustable toolmakers' square, and optical-center locater.

20A-70. Hydraulic Clamping Among Many Ingenious Tooling Devices at Link-Belt Plant. Gerald Eldridge Stedman. *Machine and Tool Blue Book,* v. 45, Feb. 1949, p. 111-116.

Special-purpose machine tools, hydraulic clamping devices, multiple machining, and ingenious tooling. The milling of teeth in a reducer-wheel-flange face. The operation involves a flute, taper, and radial cut.

20A-71. Centerless Grinding With a Cammed Regulating Wheel. *Machine and Tool Blue Book,* v. 45, Feb. 1949, p. 162-164, 166-167.

Equipment and procedures.

20A-72. Ideas From Readers. *Modern Machine Shop,* v. 21, Feb. 1949, p. 198-200, 202, 204, 206, 208.

"Fixture Equipped with Electric Signal to Indicate Proper Positioning," Clifford T. Bower; "Spring-Loaded Die Stop," Roger Isetts; "A Special Strap Wrench," E. R. Yarham; "Positive Print Cabinet," Bert Charlesworth; and "A Handy Boring Head," Robert Mawson.

20A-73. Developments in Carbide Grinding. F. J. Benn. *Tool Engineer,* v. 22, Feb. 1949, p. 17-21.

Comparative properties of different types of abrasive materials, use of silicon carbide wheels, selection of diamond wheels, offhand grinding, surface grinding, diamond concentration, and dressing of diamond wheels.

20A-74. Machining Metallized Surfaces. Thomas A. Dickinson. *Tool Engineer,* v. 22, Feb. 1949, p. 29.

Recommended procedures.

20A-75. Automatic Finishing Cuts Cost. A. E. Rylander. *Tool Engineer,* v. 22, Feb. 1949, p. 30-32.

The basic types of automatic finishing equipment, manufactured by Acme Mfg. Co., Detroit.

20A-76. High Production With Standard Equipment. Lloyd L. Lee. *Tool Engineer,* v. 22, Feb. 1949, p. 33.

By combining standard machine tools with standard auxiliary drilling units plus clever tool engineering, production outputs in many instances, equal those usually obtained with special-purpose equipment. One case is the drilling of eight holes in the bottom of a saw table, and three holes in each of the two sides.

20A-77. Cutting Tools and Fixtures. VIII. A. E. Rylander. *Tool Engineer,* v. 22, Feb. 1949, p. 38-39.

Fundamentals of tool design illustrated by a description of tooling for a part which has been specially "designed" to include a number of operations, all requiring cutting tools.

20A-78. Gadgets. *Tool Engineer,* v. 22, Feb. 1949, p. 40-41.

"Straightener for Coiled Spring Wire," M. C. Smith; "Handy Angle-Square," George Hull; "A Big Job on a Small Machine," Robert Mawson; "An Improvised Boring and Threading Tool," Edward Diskavich; and "Drift for Tanged Tools," George Hull.

20A-79. Dual Template Automatic-Cycle Method Slashes Gear Blank Machining Time. Thomas E. Swander. *Production Engineering & Management,* v. 23, Feb. 1949, p. 51-55.

A production increase of 37% is attributed to the use of two tracer-controlled machines.

20A-80. Carboloy Boring Bars Foster Precision. *Production Engineering & Management,* v. 23, Feb. 1949, p. 55.

Precision boring machine designed specifically for the use of solid cemented-carbide boring bars.

20A-81. Factors Affecting the Design of Jigs and Fixtures. Roger Isetts. *Production Engineering & Management,* v. 23, Feb. 1949, p. 56-58.

As applied to machine-shop operations.

20A-82. Mechanism Loads Gear Machines. *Production Engineering & Management,* v. 23, Feb. 1949, p. 58.

20A-83. (Book). **Metal Cutting Tools.** P. S. Houghton. 283 pages. 1948. Chapman & Hall, Ltd., 37, Essex St., London, W. C. 2, England. 25s.

Although the subject matter covers a wide range of tools, every endeavor has been made to leave out unnecessary details and concentrate on those tools on which information is usually most required. (From review in *Aircraft Production.*)

20A-84. (Book). **Turret Lathe Tooling.** Ed. 2. Howard Freeman, Sir Isaac Pitman and Sons, Ltd., 39, Parker St., London, W. C. 2, England. 12s. 6d. net.

Deals in the main with standard tooling, with the possible exception of the thread-rolling attachment and one or two other items.

20B—Ferrous

20B-10. New Tool Ups Production at Seattle Plant. *Western Machinery and Steel World,* v. 40, Jan. 1949, p. 81.

Use of an American duplicating lathe for duplication of shafts.

20B-11. Steam Turbines for Electric Power. Ralph G. Paul. *Western Machinery and Steel World,* v. 40, Jan. 1949, p. 70-73.

Machining operations and equipment in production of above in Westinghouse's Sunnyvale, Calif., plant.

20B-12. Machining Operations on Steering Assemblies. J. J. Shepp. *Machinery* (London), v. 74, Jan. 13, 1949, p. 35-38.

Methods used by Kaiser-Frazer at Willow Run.

20B-13. "Cool" Grinding Surface Hardened Steel. H. J. Chamberland. *Steel,* v. 124, Jan. 31, 1949, p. 56-58.

Heat generated by the grinding action is substantially reduced and surface cracks thereby eliminated by use of a system which permits coolant to flow through the pores of the grinding wheel.

20B-14. Maschinen und Verfahren in der Rasierklingen-Herstellung. (Machines and Methods Used in the Production of Razor Blades.) F. Kurek. *Zeitschrift des vereines Deutscher Ingenieure,* new ser., v. 90, April 1948, p. 125-128.

Equipment and procedures, including machining and heat treatment.

20B-15. The Machining of Stainless Steel. Part I. Lester F. Spencer. *Steel Processing,* v. 35, Jan. 1949, p. 31-35, 51.

Recommended procedures, based on analysis of the various factors that influence machinability of common stainless steel compositions.

20B-16. Caterpillar's Huge Diesel Engine Plant. Joseph Geschelin. *Automotive Industries,* v. 100, Feb. 1, 1949, p. 30-32, 80, 82.

Machine-shop equipment and procedures.

20B-17. Carbide Tooling Boosts Production 6×'s. *Tool & Die Journal,* v. 14, Feb. 1949, p. 62.

The complete machining of a lightning arrester plug, from SAE 1020 round bar stock.

20B-18. Contour Controls on a Car Wheel Boring Mill. W. B. Wigton. *Electrical Manufacturing,* v. 43, Feb. 1949, p. 86-92, 184, 186.

Fully automatic machining of complex wheel treads at high production rates with single-point carbide-tipped tools has been attained by adaptation of stepping-type relay controls superimposed on magnetic contouring controls for interlocked coordinate movements of several tool heads.

20B-19. Hardness—A Machinability Index? J. B. Armitage and A. O. Schmidt. *American Machinist,* v. 93, Feb. 10, 1949, p. 98-99.

To establish preliminary speed and feed rates, hardness of steel is often taken as an index of machinability. However, tool life and optimum production are affected by composition as well as by hardness. Comparative horsepower and tool-life tests were made on seven representative steels. Output loss per grind is approximately two-thirds when hardness is increased from 200 to 300 Brinell. Sharp reductions in speed and feed are required to mill 400-Brinell steel.

20B-20. Gear Production Speeded Up By Honing Before Hardening and Spline Broaching. William H. Cortwright. *Machinery* (American), v. 55, Feb. 1949, p. 162-164.

Innovation at Warner Gear Div., Borg-Warner Corp.

20B-21. Surface Broaching of Bearing Saddles Aids in Mass Production of Diesel Locomotives. Guy Hubbard. *Steel,* v. 124, Feb. 14, 1949, p. 109-110, 126.

Vertical duplex machine of extraordinary size features an indexing arrangement which divides machining of radius among four cutter segments.

20B-22. Kent-Owens Milling Machine Used for Milling Irregular Slots in Piston Rings. *Modern Machine Shop,* v. 21, Feb. 1949, p. 194, 196.

20B-23. Broaching Cylinder Heads With Single Point Carbide Tipped Tools. *Machine and Tool Blue Book,* v. 45, Feb. 1949, p. 169-173.

20B-24. Magazine Loading Speeds Gear Shaving. Rex Heath. *Tool Engineer,* v. 22, Feb. 1949, p. 22-23.

20B-25. Making Hydraulic Valve Lifters With Ultra-Precision Equipment. Joseph Geschelin. *Automotive Industries,* v. 100, Feb. 15, 1949, p. 42-45, 82.

Operations at Diesel Equipment Div., General Motors Corp.

20B-26. Progress Report No. 2 on Tool-Chip Interface Temperatures. K. J. Trigger. *Transactions of the American Society of Mechanical Engineers,* v. 71, Feb. 1949, p. 163-170; discussion, p. 170-174.

Effects of cutting speed upon cutting temperature, chip thickness, and chip hardness, when steel at various hardness levels is machined with cemented-carbide tools. In most of the tests a carbide tool containing W, Ti, and Ta was used. A straight WC tool was used in one series of tests.

20C—Nonferrous

20C-4. Manufacture of Carbide Dies. *Machinery* (American), v. 55, Feb. 1949, p. 170-171.

To simplify the discussion of practices generally adopted in manufacturing carbide dies, the steps followed in building a simple drawing die are described. Begins with boring and grinding operations on the blank and includes surface finishing procedure.

20C-5. How to Machine Beryllium Copper. John T. Richards. *American Machinist,* v. 93, Feb. 10, 1949, p. 101-116.

Current machining practice for the 2% high-strength alloy, which is the one in common use today.

20D—Light Metals

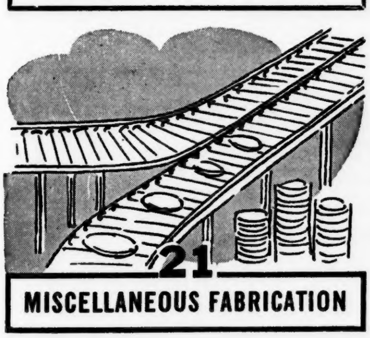
20D-5. Tallow Grease Used to Lubricate Aluminum-Cutting Tools. Leo M. Carey. *Machinery* (American), v. 55, Feb. 1949, p. 176.

When tapping small holes in very soft aluminum, it was found that the metal gouged the flutes of the tap when conventional fluids were employed. These difficulties led to the trial of a nonabrasive buffing compound as a lubricant. Results were ease of tapping, absence of gouging, and a fine finish on the threads produced. Equally successful results were obtained in drilling small holes and in cutting off thin-walled aluminum tubing with a circular saw.

20D-6. Increase in the Mechanical Strength of Aluminum During Cutting in Inert and Surface-Active Media. (In Russian.) N. A. Pleteneva, L. A. Shreiner, and P. A. Rebinder. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 62, Oct. 11, 1948, p. 653-655.

The mechanism of the strengthening process; experimental methods.

For additional annotations indexed in other sections, see:
19A-19



21A—General

21A-13. Compressed Air Facilitates Production of Vacuum Cleaners and Water Coolers. *Western Machinery and Steel World,* v. 40, Jan. 1949, p. 88-89.

Compressed-air applications at Interstate Engineering Corp., El Segundo, Calif.

21A-14. Materials Shortages and Rising Labor Costs Force Changes in Manufacturing Techniques. Herbert Chase. *Materials & Methods,* v. 29, Jan. 1949, p. 60-63.

Current practice in three major forming categories: casting; sintering powdered-metal compacts; and mechanical forming from wrought metal shapes. Use of alternate methods to reduce production costs and conserve materials.

21A-15. Three Metallizing Techniques for Component Design. J. C. Lebens. *Electrical Manufacturing,* v. 43, Feb. 1949, p. 120-125, 196, 198, 200, 202, 204.

Advantages, limitations, and applications of printed circuits, hermetic sealing, and electroforming of precision parts for mass-production. Printed circuits are prepared by at least 26 methods which can be grouped into 6 classes: painting, spray deposition, chemical deposition, vacuum deposition, dusting, and die-stamping. 11 ref.

21A-16. Radiator Production Mechanized at Ford Motor "River Rouge" Plant. *Industrial Heating,* v. 16, Jan. 1949, p. 28-30, 32, 34, 36, 38, 40, 138.

Forming, annealing, joining, assembly. (To be continued.)

21B—Ferrous

21B-9. Versatility Spells Success. *Western Machinery and Steel World,* v. 40, Jan. 1949, p. 86-87.

Production of miscellaneous sheet-metal cabinets and tanks.

21B-10. 100 Valve Tappets a Minute. Vincent Trolley. *Iron Age,* v. 163, Feb. 3, 1949, p. 110-115.

Drawing, welding, heat treating, and grinding operations; and material-handling methods at Ford's River Rouge plant. A feature of the line is a progressive die arrangement in a 200-ton mechanical press.

For additional annotations indexed in other sections, see:
19B-21; 19D-11-13

22A—General

22A-28. Heliarc Welding Shows Notable Versatility. Thomas A. Dickinson. *Western Metals,* v. 7, Jan. 1949, p. 30-31.

Various applications.

22A-29. Selection of Equipment for Three-Phase Arc Welding. (In Russian). N. S. Siunov. *Avtogennoe Delo* (Welding), Oct. 1948, p. 1-6.

Various types of equipment. Particularly high operating efficiency was shown by automatic welding with the 3-phase arc under flux.

22A-30. Method of Determination of Basic Mechanisms of the Electrode-Melting Process During Arc Welding. (In Russian.) A. A. Erokhin. *Avtogennoe Delo* (Welding), Oct. 1948, p. 6-11.

Determination of coefficient of loss, rate of electrode melting, coefficients of "weight of coating" (ratio between amount of coating and electrode metal melted), and coefficient of slag yield. Formulas for calculation.

22A-31. Automatic Argon-Arc Welding of Thin Sheet Metals. (In Russian.) A. Ya. Brodskii. *Avtogennoe Delo* (Welding), Oct. 1948, p. 11-17.

Method and equipment. Sphere of application and optimum conditions of operation.

22A-32. Control of Warping of Thin Sheets During Arc Butt Welding. (In Russian.) N. N. Prokhorov. *Avtogennoe Delo* (Welding), Oct. 1948, p. 17-20.

Causes of warping. Methods of decreasing or completely eliminating it.

22A-33. Gummi-Metall-Bindung mit Hilfe von Vermessingung. (Rubber-Metal Joining by Means of Brass Plating.) G. E. Proske. *Metalloberfläche,* v. 2, April 1948, p. 79-83.

The method is based on the observation that normal soft rubber, when vulcanized on metal, does not adhere to iron but does adhere to brass. For this purpose, however, the brass plating must be done by a special method.

22A-34. A Survey of Established Processes for the Jointing of Metals. (Concluded.) D. F. Hewitt. *Sheet Metal Industries,* v. 25, July 1948, p. 1399-1400; Sept. 1948, p. 1813-1821.

July: plastic bonding; Sept.: riveting; joint design.

22A-35. Two Methods of Estimating the Weldability of Metals by Resistance Measurement. W. S. Simmie. *Sheet Metal Industries,* v. 25, July 1948, p. 1407-1409.

Methods and equipment for low and high-pressure resistance measurement as an aid in estimation of weldability.

22A-36. The Application of Resistance Welding to Sheet Metal Practice. L. H. Park. *Sheet Metal Industries,* v. 25, Dec. 1948, p. 2487-2494, 2496, 2498.

Seam welding; resistance weld overlaps; electrode pick-ups; welding fits; weld distortion; projection welding; electric heading or riveting; resistance soldering and brazing; soldering and brazing alloys and fluxes.

22A-37. Some Fundamental Principles of Argon Arc-Welding. *Sheet Metal Industries,* v. 26, Jan. 1949, p. 169-170, 174.

22A-38. Here's How Welding Research and Development Pay Off at International Harvester. C. D. Evans. *Industry and Welding,* v. 22, Feb. 1949, p. 26-29, 46, 48, 50.

Equipment, procedures, and research programs.

22A-39. Analyzing the Cause of Failures in Weldments. Gerald von Stroh. *Machine and Tool Blue Book,* v. 45, Feb. 1949, p. 135-140, 142, 144, 146-150, 152, 154-155.

An analysis of various failures, their causes, cures, as well as fundamental design facts.

22A-40. Practical Aspects of Inert-Gas Welding. H. A. Huff, Jr., and A. N. Kugler. *Welding Journal,* v. 28, Feb. 1949, p. 128-140.

Description of the process; gases used; electrodes; straight vs. reversed polarity, d.c. and a.c. welding equipment; control of gas flow; and techniques in welding stainless steel, aluminum, copper, magnesium, steel, and other metals.

22A-41. New Approach to Single Phase

Welding. Ivar W. Johnson. *Steel,* v. 124, Feb. 14, 1949, p. 93-94.

The possibility of greatly improving the spot welding of aluminum and its alloys in particular, and of enhancing resistance welding in general, is demonstrated by an investigation of the effect of varying the current envelope of a standard 60-cycle spot welder.

22A-42. That Problem of Radio Interference. *Welding Engineer,* v. 34, Feb. 1949, p. 33-37, 48. Based on "Recommended Practices for the Installation of High-Frequency Stabilized Arc Welding Equipment," prepared by R. R. Lobosco for National Electrical Manufacturers Association.

How to avoid radio interference with high-frequency stabilized installations for inert-gas arc welding.

22A-43. What Welding Means to America. Part One: Primary Metals Industries. T. B. Jefferson. *Welding Engineer,* v. 34, Feb. 1949, p. 38-39, 64.

Results of survey.

22A-44. Production Processes—Their Influence on Design. Part XLI. Butt Welding. Roger W. Bolz. *Machine Design,* v. 21, Feb. 1949, p. 103-110.

Various methods and equipment; design recommendations.

22A-45. The Design and Fabrication of Welded Structures Subjected to Repeated Loading. Part I. R. Weck. *Welder,* new ser., v. 17, Oct.-Dec. 1948, p. 91-96.

Starting from first principles, this series of articles will present available information on fatigue failure in simple language and in a form most useful to the welding engineer. (To be continued.)

22A-46. Some Aspects of Welding Research in Great Britain and America. Part I. H. G. Taylor. *Transactions of the Institute of Welding,* v. 11, Dec. 1948, p. 206-211.

Work of the British Welding Research Association. (To be concluded.)

22A-47. Cyclic Heating Test of Main Steam Piping Joints Between Ferritic & Austenitic Steels, Sewaren Generating Station. H. Weisberg. *American Society of Mechanical Engineers,* Paper No. 48-A-87, 1948, 15 pages.

Describes tests. Tables summarize data on the weld joining of full-size, heavy-wall pipe joints.

22A-48. Survey of Automatic Arc and Gas Welding Processes as Used in the Automotive Industry. *Automotive Welding Committee, American Welding Society* (New York), 1948, 17 pages.

Basic principles and general limitations affecting each process. Data apply primarily to the welding of butt joints.

22A-49. (Book). **Practical Arc Welding.** 516 pages. 1948. Hobart Brothers, Box EW-82, Troy, Ohio. $2.00

Arc welding and its applications. Illustrations of actual welding jobs, tables and charts of useful data are included.

22B—Ferrous

22B-45. Wider Steel Sheets by Automatic Welding. *Automotive Industries,* v. 100, Jan. 15, 1949, p. 39.

Special machine developed by Ford Motor Co. for seam welding of two narrow sheets to produce the wide sheet required for underbody stampings.

22B-46. Some Interesting Phases of Cadillac Bumper Production. Joseph Geschelin. *Automotive Industries,* v. 100, Jan. 15, 1949, p. 40-41, 82.

Welding, finishing, and plating operations.

22B-47. Repairs to Welded Tanker "Hyalina". E. J. Hunter. *Transactions of the Institute of Welding,* v. 11, Dec. 1948, p. 212-215.

22B-48. Submerged Arc Skip Welding Ring Gears to Stamped Flywheels. S. M. Spice. *Iron Age,* v. 163, Jan. 27, 1949, p. 68-71.

By development of special controls and timing devices, automatic submerged-arc welding equipment was adopted by Buick to make a series of 2-in. long welds that join a ring gear to a stamped steel flywheel. Production has been increased 400%, weld rejections have been almost eliminated, and distortion is easily held within rigid limits.

22B-49. Design and Fabrication of a Welded Tubular Steel Boom. A. Scott and E. McMinn. *Welding,* v. 17, Jan. 1949, p. 2-8.

Design and fabrication of a welded tubular boom 113 ft. in length and weighing, with fittings, 6.06 tons.

22B-50. The Future of Welding in Shipbuilding. *Welder,* new ser., v. 17, Oct.-Dec. 1948, p. 73-75.

Introduction by Charles S. Lillicrap, and brief discussions by Wilfrid Ayre, Archibald Hurd, J. M. Ormston, John Crighton, and J. L. Adam.

22B-51. Economies of Welding in Shipbuilding. J. W. Rudkin. *Welder,* new ser., v. 17, Oct.-Dec. 1948, p. 78-80.

Quantitative data on the above.

22B-52. Radiography as Used in Naval Construction for the Control of the Quality of Welding. D. W. Smithers. *Welder,* new ser., v. 17, Oct.-Dec. 1948, p. 81-90.

22B-53. Some Problems Associated With the Development of Light Gauge Metallic Arc Welding. E. S.

Waddington. *Sheet Metal Industries,* v. 25, Sept. 1948, p. 1829-1836, 1840.
Equipment and procedures. Includes tables of welder settings and electrode specifications for stainless. Confined to ferrous sheet.

22B-54. The Metallurgical Aspects of Fusion Welding in Relation to the Weldability of Steels. (Concluded.) H. Granjon. *Sheet Metal Industries,* v. 25, Sept. 1948, p. 1837-1840.
The heat treatment of weldments as compared with ordinary heat treatment. Indicates unsolved problems. 13 ref.

22B-55. The Hard-Facing of Punches and Dies. *Sheet Metal Industries,* v. 26, Jan. 1949, p. 137-138.
Use of Stellite-faced punches and dies. Design of blank for a typical hot-blanking die.

22B-56. Contact Arc-Welding; A Description of a New Technique. P. C. van der Willigen. *Sheet Metal Industries,* v. 26, Jan. 1949, p. 155-160, 168.
New method developed in Holland during and after World War II.

22B-57. Welded Fittings Fabricated From Flat Steel Plate. *Iron Age,* v. 163, Feb. 3, 1949, p. 121.
Fabrication procedure used in making fittings for 8-50 in. diameter natural-gas pipeline.

22B-58. Welding Angle-Irons Without Clamps. Gustaf S. Beckman. *Machinery* (American), v. 55, Feb. 1949, p. 201.
Partial cutting and bending technique.

22B-59. Studwelding—A Versatile Metal Fastening Process. Robert C. Singleton. *Materials & Methods,* v. 29, Feb. 1949, p. 66-69.
Process eliminates drilling and tapping operations.

22B-60. Automatic Brazing Speeds Output of Steel-Finned Condensers. Jay DeEulis. *Steel,* v. 124, Feb. 7, 1949, p. 92-95.

22B-61. English Weld Cracking Test: New Method of Checking High-Tensile Steels. *Steel,* v. 124, Feb. 7, 1949, p. 120, 122, 124, 127. Based on paper by P. L. J. Leder, *Iron and Coal Trades Review.*
See abstract from *Engineering,* item 22b-214, 1948.

22B-62. Welding Saves 20% in Steel in Cat-Cracker Equipment. *Petroleum Processing,* v. 4, Feb. 1949, p. 139-144. Based on "Design Progress and Economy in Welded Fluid Catalytic Cracking Plant," by Egon F. Brummerstedt.
Improvements made, through use of electric welding, in the mechanical design of a modern fluid catalytic cracking plant.

22B-63. How to Cut Clad Steels. Leonard W. Williams. *Industry and Welding,* v. 22, Feb. 1949, p. 30-32.
Recommended procedures.

22B-64. When to Braze or Fusion Weld Cast Iron. K. H. Koopman. *Industry and Welding,* v. 22, Feb. 1949, p. 34, 36, 38, 40-41, 62.
How to choose the best of the above two methods for a specific job. Table shows simple tests for identifying cast iron.

22B-65. Are You Welding Alloy Steel? T. N. Armstrong. *Industry and Welding,* v. 22, Feb. 1949, p. 42-44, 63-64.
Recommended procedures.

22B-66. Welding of Broom Machine Frame Reduces Weight and Cost. *Modern Machine Shop,* v. 21, Feb. 1949, p. 186, 188.

22B-67. Vibrated Electrode Holder. C. K. Wilson. *Electrical Manufacturing,* v. 43, Feb. 1949, p. 126-128.
A special welding tool was designed to produce a low-cost safety tread on steel. Held and pointed like a pistol, this tool deposits a hard, wear resistant bead.

22B-68. Stud Welding Cuts Costs. *Electrical Manufacturing,* v. 43, Feb. 1949, p. 136, 138, 204.
Three examples from production of electric water heaters which show cost reduction through use of welded studs for mounting heating elements.

22B-69. Riveted vs. Welded Ship Structure. E. M. MacCutcheon. *Welding Journal,* v. 28, Feb. 1949, p. 111-117; discussion, p. 118-122.
Investigations of the cracking of merchant ships during World War II have uncovered new evidence bearing on the relative incidence of cracks in ship structures fabricated by riveting and by welding. It is concluded that there is no evidence indicating that either riveted or welded structure is more susceptible to the inception of cracks.

22B-70. Fabrication of Structural Steel Sections. J. M. Tippett. *Welding Journal,* v. 28, Feb. 1949, p. 123-127.
How large and unusual structural sections may be fabricated by submerged-melt welding.

22B-71. Welding Alloy Steels for High-Temperature Service. M. E. Holmberg. *Welding Journal,* v. 28, Feb. 1949, p. 141-148.
Based principally on study of failures in welded alloy structures. Limited to processing equipment such as used in gasoline plants and refineries, mostly piping. Various types of service failures. Design for welding and alloy selection.

22B-72. Stoves Fabricated by Resistance Welding. Robert C. Glatz. *Welding Engineer,* v. 34, Feb. 1949, p. 42-43.
Procedures and equipment.

22B-73. Electric Locomotives for Brazil. K. P. O'Kelly. *Welding Engineer,* v. 34, Feb. 1949, p. 49-51.
Welded construction.

22B-74. Brazing Big Wheel. Phil Glanzer. *Welding Engineer,* v. 34, Feb. 1949, p. 62.
Repair of a cracked roller casting 26 in. in diameter.

22B-75. Ship Welding and the Influence of Residual Stress. (Concluded.) C. H. Stocks and J. W. G. Thurston. **Welding,** v. 17, Jan. 1949, p. 30-37.
See abstract of first installment, item 22B-43, 1949.

22B-76. First Production Example of High Speed, Skip Welding. *Automotive Industries,* v. 100, Feb. 15, 1949, p. 46, 70.
Above process of the Buick Motor Div. of G. M. as developed in connection with Lincolnweld submerged arc welding.

22C—Nonferrous

22C-5. The Welding of Lead; Applications and Techniques. G. F. Charge and R. Beynon. *Welding,* v. 17, Jan. 1949, p. 24-29, 37.
Modern techniques for carrying out work in various operating positions.

22C-6. The Welding of Non-Ferrous Metals. (Concluded.) **XII. The Welding of Low Melting Point Metals. XIII. The Welding of High Melting Point Metals. XIV. The Welding of the Precious Metals.** E. G. West. *Sheet Metal Industries,* v. 25, July 1948, p. 1405-1406, 1409; Aug. 1948, p. 1621-1626; Oct. 1948, p. 2046-2047; Nov. 1948, p. 2265-2268, 2271.
Final installments of a series to be published in book form.

22C-7. Recent Developments in the Pressure Welding of Light Alloys. R. F. Tylecote. *Sheet Metal Industries,* v. 26, Jan. 1949, p. 161-168.
Results of some work on copper alloys are also included.

22C-8. Materials Joined by New Cold Welding Process. A. B. Sowter. *Welding Journal,* v. 28, Feb. 1949, p. 149-152.
Previously abstracted from *Materials & Methods,* item 22c-29, 1948.

22D—Light Metals

22D-8. Welding for Wire-Drawing. J. Hutchinson. *Wire Industry,* v. 16, Jan. 1949, p. 47, 49-50; discussion, p. 50.
Principles of resistance welding in general; spot welding of light-alloy rod to be used in wiredrawing.

22D-9. The Tensile Strength of Gas Welds in a Magnesium-Manganese Alloy. J. Pendleton. *Sheet Metal Industries,* v. 25, Aug. 1948, p. 1628-1634, 1636; Sept. 1948, p. 1841-1846, 1848.
Experimental investigation using three 1.5% Mn, commercial Mg alloys in sheet form and four types of rods. Mechanical properties and microstructures obtained; the effect of cold work on grain growth; the effect of tacks and re-starts; effects of various heat treatments; and possible effects of stress corrosion. 11 ref.

22D-10. Further Examination of the Tensile Strength of Gas Welds in a Magnesium-Manganese Alloy. J. Pendleton. *Sheet Metal Industries,* v. 25, Oct. 1948, p. 2049-2052.
Findings reported in a previous paper on the same subject were not confirmed by other workers. Further work was done to determine reasons for the discrepancy. Conclusions based on this and the previous work.

22D-11. Joining Heavy Aluminum Sections Simplified by Gas-Shielded Arc Welding. *Materials & Methods,* v. 29, Feb. 1949, p. 65.
The conventional non-consumable electrode is replaced by a continuously fed consumable wire for gas-shielded arc welding of heavy sections of aluminum and Al alloys.

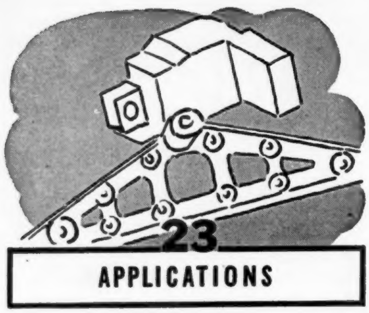
22D-12. Heliwelding Used as Repair Tool. *Iron Age,* v. 163, Feb. 17, 1949, p. 92.
Replacement of a bottom on an aluminum chemical-storage tank.

22D-13. Arc Welding of Aluminium and its Alloys. (Continued.) A. Schärer. *Light Metals,* v. 12, Jan. 1949, p. 12-19. Translated from the German.
Mechanical properties and microstructures of arc and gas-welded alloys of the Avional-M (Al-Cu-Mg type). (To be concluded.)

22D-14. Wiped Joints for Aluminium Sheathed Cables. *Engineer,* v. 187, Jan. 28, 1949, p. 102-103.
A method substantially similar to the familiar lead-wiping process.

For additional annotations indexed in other sections, see:

6B-29-31; 7B-19; 8-41; 9-31; 18B-23; 19B-21; 19D-11; 24A-12-16-20; 24B-5-6



23B—Ferrous

23B-6. Alloys for Heat Treating Equipment. Hugo W. Hiemke. *Western Metals,* v. 7, Jan. 1949, p. 27-29.

Development and properties of Ni-Cr steels, which resist scaling and carburization, for use in equipment and fixtures used for high-temperature hardening operations.

23B-7. Materials Used in Steam Turbine Rotor Forgings. C. Sykes. *West of Scotland Iron and Steel Institute,* 1947, 45 pages.

Types of steel used, their properties and methods of manufacture and inspection.

23B-8. How Durable is Porcelain Enameled Roofing? *Enamelist,* v. 26, Jan. 1949, p. 29-30, 68.

The answer given is that a 17-year test on a gas-station roof shows no change.

23B-9. La technique de l'emploi simultané de l'acier coulé et du soudage en construction mixte. (The Technique of Simultaneous Application of Cast Steel and Welding in Compound Structures.) Henri Gerbeaux. *Fonderie,* Oct. 1948, p. 1335-1353.

Use of cast steel and welding for the production of a series of implements, such as machine parts, railroad equipment, hydraulic installations. Such applications require the development of special steels.

23B-10. Steel Conservation in Lightweight Freight Cars. Marvin Barloon. *Iron Age,* v. 163, Feb. 3, 1949, p. 102-109.

Construction of freight cars of low-alloy lightweight steels is urged as a means of permitting an urgently needed increase in car output without increasing steel needs above present tonnages. Examines the more common objections to this type of construction and attempts to refute them.

23B-11. Circular Saws; Problems in the Design, Manufacture, and Operation of Standard Saws for All-Purpose Work. R. D. Brooks. *Mechanical Engineering,* v. 71, Feb. 1949, p. 133-138.

23B-12. How to Select Materials for Plastic Molds. L. J. Morrison. *Steel,* v. 124, Feb. 14, 1949, p. 110, 112, 114, 116, 118, 120, 123.

See abstract from *Machinery* (American), item 23B-3, 1949.

23B-13. The Use of Stainless Steel in the Chemical and Food-Processing Industries. J. A. McWilliam. *Murex Review,* v. 1, no. 1, 1948, p. 1-11.

23C—Nonferrous

23C-8. Aluminium Conduit and Accessories. J. L. Simpson. *Light Metals,* v. 12, Jan. 1949, p. 38-42.

Use and advantages of the above and reasons for the development of zinc-base accessories.

23C-9. The Telecommunications Industry. Some Metallurgical Problems of Materials and Maintenance. E. Mills. *Sheet Metal Industries,* v. 25, July 1948, p. 1369-1382.

Factors influencing choice of materials, and properties and applications of the various broad groups of metals and alloys. Factors are space, wear, and corrosion. Applications include cable alloys, contacts, and contact materials. Light alloys, copper, brasses, phosphor bronzes, and nickel silver are discussed.

23C-10. The Use of Zinc-Alloy Diecastings in the Code Lock. H. K. Barton. *Machinery* (London), v. 74, Jan. 27, 1949, p. 114-117.

23C-11. Copper-Base Alloys for Springs. I. Harold C. R. Carlson. *Product Engineering,* v. 20, Feb. 1949, p. 103-107.

Theory of corrosion and causes of galvanic corrosion and stress-corrosion cracking. Gages and temper hardnesses in which Cu-base alloy wire and strip are available. Workability and joining methods.

23C-12. Solving Corrosion Problems With Lead and Tin Die Castings. *Die Castings,* v. 7, Feb. 1949, p. 22-23, 68-70.

Use for various parts of label pasters which come in contact with liquid adhesives.

23C-13. Catalysts From Alloys of Nickel and Non-Catalytic Metals. W. J. Kirkpatrick. *International Nickel Co.,* Industrial Fellowship No. 306, 1948, 29 pages.

Reviews the literature on preparation and properties of alloys, preparation of catalyst by removal of non-catalytic metal from the alloy, lump catalyst for continuous processes, and properties of catalysts.

23C-14. (Book). **The Science of Dental Materials.** Ed. 3, revised. Eugene W. Skinner. 410 pages. 1946. W. B. Saunders Co., Philadelphia.

Physical and chemical properties and principles involved in application and manipulation of gold and its alloys, dental amalgams, zinc phosphate, copper, cements, gypsum products, waxes, plastics, porcelain, and abrasives.

23C-15 (Book). **Copper Flashings and Weatherings.** 105 pages. 1948. Copper Development Association, Grand Buildings, Trafalgar Square, London, W. C. 2, England.

A handbook giving practical details for using copper sheet and strip. Specifications and properties.

23D—Light Metals

23D-13. Metallic Vinyls Make Good. *Modern Plastics,* v. 26, Feb. 1949, p. 66-67.

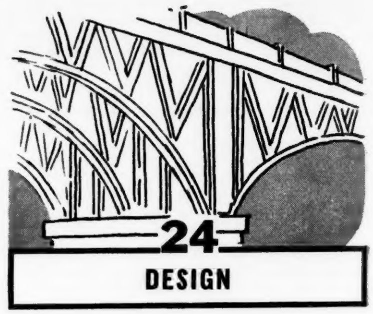
Metallic vinyls are compounded from vinyl resins and aluminum powder and made into flexible sheeting for production of raincoats, drapes, bedspreads. The metal powder eliminates undesired slick glossiness and makes possible attractive solid colors.

23D-14. Some Metallurgical Problems of Importance to Aircraft. H. Sutton. *Journal of the Institute of Metals,* v. 75, Dec. 1948, p. 269-284.

Some problems in relation to design tendencies, materials available, and present difficulties. The properties of modern light alloys of the Al-rich and Mg-rich types and their suitability for aircraft applications. Special characteristics of Al-Zn-Mg high-strength material, and recent advances in the use of Mg-rich alloys. Fatigue problems and fields in which further work is desirable. 22 ref.

For additional annotations indexed in other sections, see:

3C-14-25; 5C-2; 6C-7



24A—General

24A-4 (Book). **Mathematics at Work.** Holbrook L. Horton. 728 pages. Industrial Press, 148 Lafayette St., New York 13, N. Y. $6.00.

A working manual intended for machine designers, tool engineers, gage designers, mechanical draftsmen, technical or trade school students, and teachers. Practical applications of arithmetic, algebra, geometry, trigonometry, and logarithms are illustrated.

24A-5. (Book). **Mechanics of Materials.** Glen Murphy. 304 pages. Irwin-Farnham Publishing Co., 332 South Michigan Ave., Chicago 4, Ill. $4.50.

Textbook was written to assist in developing an understanding of the behavior of loaded structural members and machine parts. Principles of statics, geometrical characteristics of the loaded member, and effects of the material's properties are emphasized in considering each type of stress situation. A minimum of emphasis is placed on formulas as such. Some elementary aspects of design application are included, as well as sample problems following each chapter. (From review in *Machine Design.*)

24A-6. Design Charts for Longitudinally Stiffened Wing Compression Panels. Norris F. Dow. *SAE Quarterly Transactions,* v. 3, Jan. 1949, p. 122-142; discussion, p. 143-44.

Problems encountered in design of the above; results of extensive experimental investigations on the strength of such panels; development of design charts.

24A-7. Is it Cheaper to Buy or Make Parts? Alvah I. Root. *Materials & Methods,* v. 29, Jan. 1949, p. 54-55.

Example of the thumb piece for kitchen-cabinet handles. Cost analysis of production of this piece by metal stamping, by die casting, or from plastic.

24A-8. Needed—More Coordination Between Materials, Design and Processing. H. R. Clauser. *Materials & Methods,* v. 29, Jan. 1949, p. 70-73.

Illustrates the above by a number of specific cases.

24A-9. Designing Bolts to Resist Shock Loading. Charles Lipson. *Fasteners,* v. 5, No. 3, [1948], p. 4-6.

Application of well-known principles can increase bolt life appreciably.

24A-10. Locking Cap Screws in Tapped Holes. William G. Waltermire. *Fasteners,* v. 5, No. 3, [1948], p. 14-19.

Various methods for the above. The different devices used include lockwashers, wire locking, and use of special threads and head designs.

24A-11. The Development of Complex Patterns. (Continued.) A. Dickason. *Sheet Metal Industries,* v. 25, July 1948, p. 1395-1398; Oct. 1948, p. 2013-2017.

(Turn to page 54)

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Announcing the new up-to-date edition of B-34 "Copper and Copper Alloy Specifications Index". Divided in two sections with side index for easy reference to specifications, applications, and materials. American Brass Co.

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Announcing a new revised Die and Wear Parts catalog 48-WP. Full prices and data on Talide-tipped centerless grinder blades, sheet metal draw dies, wire and tube dies, drill jig bushings, etc. Metal Carbides Corp.

230. Heat Exchangers
Newly announced "Karbate" seven-tube impervious graphite shell and tube heat exchanger, series 70A. Can be converted from a single to a double pass unit by change of covers Easily adjusted to varying rates of flow and amounts of liquid handled. National Carbon Co.

231. Heat Treating
New 36-page technical catalog-manual describing the complete line of Park "Laboratory Controlled" heat treating materials and factory aids. Park Chemical Co.

232. Heating Equipment
"Eclipse Gas Pak" is a complete gas combustion assembly for firing steam boilers, heating plants, industrial ovens, etc. Bulletin H-25 contains installation diagrams, specifications and application photographs. Eclipse Fuel Engineering Co.

233. Lab Furnaces
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234. Measuring Microscopes
Bulletin 161-48 contains 24 pages describing measuring microscopes for laboratory and shop. Introduction includes information on selection and use. Gaertner Scientific Corp.

235. Nickel Plating
"Practical Nickel Plating" is a new booklet on the subject of industrial nickel plating. It discusses solution compositions and operating conditions, and suggests cycles for treatment of the base metals prior to plating. International Nickel Co.

236. Nozzles, Blasting
Complete series of Super-Titan blasting nozzles with tungsten carbide liners and accessories illustrated in new two-color catalogue. Also special booklets on uses in various industries available on request. Mills Alloys, Inc.

237. Parts, Powder Metal
"Applications and Properties of Nonferrous Powder Parts" is title of educational booklet. First part deals with technical aspects of nonferrous powders; the second half is devoted to case histories. New Jersey Zinc Co.

238. Plating Rack Coating
4-page leaflet describes "Enthonite 101" a new liquid plastic plating rack coating. Material also has extensive use for coatings to resist corrosive organic materials. Enthone, Inc.

239. Press, Hydraulic
Straightening, forming, broaching and assembling operations all competently and economically handled by the new hydraulic metalworking press just developed. Niagara Machine & Tool Wks.

240. Seam Welders
An 8-page bulletin No. 804 describes new line of roller head seam welders which embody three basic sizes for light, medium, and heavy duty work, also available in three types—for circular, longitudinal welding, or both. Progressive Welder Co.

241. Surface Control
New 8-page bulletin gives numerous practical advantages of shop control for surface roughness and waviness. Write for "More Profits to You Through Surface Control". Physicists Research Co.

242. Tube Furnace
New electric tube furnace especially designed for general research work. Materials can be tested to maximum temperature and cooled quickly. Bulletin gives full description and also typical heating and cooling curves. Harper Electric Furnace Corp.

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Metals Review, March 1949

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Sheet-metal layout principles. July: delivery and feed chutes; Oct.: the branch piece, the right conical cover, and the transformer connection. (To be continued.)

24A-12. The Commercial Weldery; A New Service and Tool for Industry. Kenneth F. Ode. *Mechanical Engineering,* v. 71, Feb. 1949, p. 139-142.

Welded design, economics, and factors to be considered in deciding between welding and some other means of fabrication.

24A-13. Some Speculations on the Future of Structural Engineering. I. Levin. *Engineer,* v. 187, Jan. 21, 1949, p. 76-77.

Design developments and the use of reinforced concrete structures, welding, high-tensile steel, and aluminum.

24A-14. The Theory of Stresses in Two-Component Glass to Metal Tube Seals. H. Rawson. *Journal of Scientific Instruments and of Physics in Industry,* v. 26, Jan. 1949, p. 25-27.

A theory, based on the Lamé theory for stresses in thick cylinders, gives the relationship between the tangential, radial, and axial stresses, at a point in a two-component tube seal and the distance of that point from the central axis of the seal. Curves show relationships between values of principal stresses at the seal interface and dimensions of the seal.

24A-15. A Reconsideration of Deformation Theories of Plasticity. D. C. Drucker. *American Society of Mechanical Engineers,* Paper No. 48-A-81, 1948, 10 pages.

Calculations and formulas. Illustrates mathematically the conclusion that large changes in the components of permanent strain may accompany very small increases in loading despite strain hardening.

24A-16. Designing for Welding. Part II. Wallace A. Stanley. *Welding Journal,* v. 28, Feb. 1949, p. 162.

Designing for roll spot welding, flash butt welding, and upset butt welding. (To be continued.)

24A-17. Design of Precision Cast Parts. J. G. Henderson. *Product Engineering,* v. 20, Feb. 1949, p. 100-102.

Design rules for reducing die cost and casting difficulties.

24A-18. Progressive Die Design. Part XII. C. W. Hinman. *Modern Machine Shop,* v. 21, Feb. 1949, p. 166-168, 170.

Describes two types of transfer feeds and a progressive die equipped with a transfer dial.

24A-19. Mechanical Investigations of Gas Turbine Components. Carl Schabtach, *American Society of Mechanical Engineers,* Paper No. 48-A-47, 1948, 13 pages.

Bursting strength of turbine and compressor wheels, fatigue strength of compressor blades, deflection and stress in nozzle diaphragms, resistance to fluctuating thermal stresses, tensile strength of dovetail attachments, rotor critical speeds, and other design criteria.

24A-20. (Book). **Design for Welding in Mechanical Engineering.** F. Koenigsberger. 210 pages. Longmans, Green & Co., 55 Fifth Ave., New York 3, N. Y.

Economic, technical and practical reasons for or against welded construction for particular cases, in comparison with other processes. Mechanical properties, weldability of steels, and shapes and sections suitable for use. Influence of properties of material upon the shape of a structure for which strength and stiffness are required to a high degree.

24A-21. (Book). **The Failure of Metals by Fatigue.** 505 pages. 1947. Melbourne University Press, Melbourne, Australia. £2.2.0.

Design, development, maintenance of machine structures, and components subjected to cyclic stresses. Proceedings of a symposium held in the University of Melbourne. (Individual papers have been previously abstracted.)

24B—Ferrous

24B-4. Report of Committee 15—Iron and Steel Structures. E. S. Birkenwald and others. *American Railway Engineering Association, Bulletin,* v. 50, Jan. 1949, p. 423-451.

Includes the following subcommittee reports: revisions of specifications for steel railway bridges; stress distribution in bridge frames-floorbeam stringers; design of steel-bridge details; and design of metal culverts of 60-in. diam. and larger, including corrugated metal arches.

24B-5. Investigation Into the Behavior of Welded Frame Structures. Seventh Interim Report. Further Tests on Stanchions. J. F. Baker and J. W. Roderick. *Welding Research,* v. 2, (Bound with *Transactions of the Institute of Welding,* v.11), Dec. 1948, p. 110r-121r.

Single and double-curvature bending of I-sections. Tests were made exactly as described in earlier reports; beam loading was completed before an increasing axial load was applied to cause collapse.

24B-6. How to Design Wheels. *Welding Journal,* v. 28, Feb. 1949, p. 158-160.

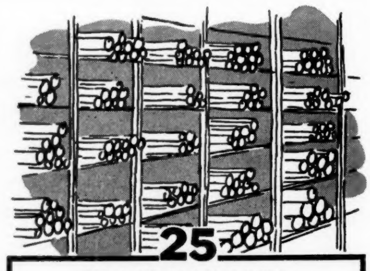
Numerous welded-wheel designs illustrated and briefly described.

24D—Light Metals

24D-1. Minimum Ribbing for Maximum Strength. *Die Castings,* v. 7, Feb. 1949, p. 34-35, 38-40.

How designers of the McCulloch chain saw have reduced stress concentrations by reducing the amount of ribbing. Magnesium die castings are used for major parts.

For additional annotations indexed in other sections, see:
14C-11; 19A-24-43; 20A-81; 22A-39-45; 22B-49



25A—General

25A-18 (Book). **Minerals Yearbook, 1946.** 1638 pages. 1948. Bureau of Mines, Washington, D. C.

Latest annual issue covers the first full postwar year. It has been made considerably easier to use through one important change in format: the individual chapters on specific minerals are arranged alphabetically. In addition, easier-to-read typeface has been employed for principal headings, side headings, and table captions. The foreign mineral review has been retained. In the present volume, this section deals with middle and South America. Of particular interest is a chapter devoted to uranium and thorium. (From review in *Petroleum Processing.*)

25A-19 (Book). **A.S.M.E. Mechanical Catalog and Directory.** 738 pages. 1949. American Society of Mechanical Engineers, 29 West 39th St., New York 18, N. Y.

Covers products of 4600 manufacturers and contains 48,500 listings. As in previous editions, the material is arranged alphabetically, according to manufacturer's names. Eleven main industrial groups are included. Directory section of 300 pages lists products covered in the catalogue under 6500 classifications, together with names and addresses of manufacturers. A third section consists of an alphabetical list of trade names.

25A-20 (Book). **Directory of Engineering Data Sources.** 65 pages. 1948. Southeastern Research Institute, Inc., 5009 Peachtree Rd., Atlanta, Ga. $2.50.

A compact reference bulletin, giving more than 500 sources of published engineering data. These include technical universities and colleges, scientific and trade societies or associations, commercial publishers of books and periodicals, and Federal agencies engaged in scientific work.

25A-21. Electrical and Allied Developments During 1948. Guy Bartlett. *General Electric Review,* v. 52, Jan. 1949, p. 11-52.

Reviews General Electric developments under the headings: research, testing and measuring, power, industry, tranportation, electromedical, electronics, lighting, air conditioning, appliances, construction materials, and chemical and metallurgical.

25A-22. American Machinist 36th Annual Review of Metalworking Equipment, Parts and Materials. *American Machinist,* v. 93, Jan. 29, 1949, p. 125-260.

A classified review of 1400 new products introduced during the past year.

25A-23. Coordination of Metallurgical Work at General Electric. William E. Ruder. *Metal Progress,* v. 55, Jan. 1949, p. 43-46.

Organization and coordination of metallurgical research and production. The Schenectady research laboratory, which is engaged in fundamental studies, is supplemented by at least 24 works laboratories throughout the U. S., all of which have some interest in metals.

25A-24. A Proposal for Research in Metallurgy. Michael G. Corson. *Metal Progress,* v. 55, Jan. 1949, p. 55-58.

Recommends that the government support a $200-million program in fundamental metallurgical research. Program would begin with preparation of large amounts of about 70 highly purified metals in three or more specific states. Other fields would be precise determinations of compressibility, specific gravity, thermal expansion, electrical and thermal conductivity, magnetic susceptibility, photoelectric effect, heat content, electrochemical and contact potential, and mono and bi-directional stress plus plasticity.

25A-25. Modern Petroleum Lubricants; A New Chemical Market. C. F. Prutton and F. F. Musgrave. *Chemical Engineering Progress* (Engineering Section), v. 45, Jan. 1949, p. 17-24.

Fundamental principles of lubricant action, bearing corrosion and inhibition, and the chemistry and mechanism of action of additives.

25A-26. Outlook in 1949 Unsettled for Materials Supplies and Prices. N. B. Bagger. *Materials & Methods,* v. 29, Jan. 1949, p. 49-53.

The following metals are considered individually: steel, pig iron, copper, lead, zinc, tin, magnesium, aluminum, and nickel.

25A-27. Materials at Work. *Materials & Methods,* v. 29, Jan. 1949, p. 74-76.

Powder cutting for scrapping of large cast-iron wheels; aluminum bronze switch bumper; stainless steel washfountain; brazing wrought-iron pipe joints; tools for spinning steel tubing.

25A-28. Review of Materials Engineering Developments in 1948. *Materials & Methods,* v. 29, Jan. 1949, p. 77-88.

Treated under the headings: trends in materials and their processing; iron and steel; nonferrous metals; nonmetallic materials; fabricated parts and forms; welding and joining; heat treating; finishing and coating; and shaping and forming.

25A-29. The Incremental Friction Coefficient—A Non-Hydrodynamic Component of Boundary Lubrication. J. T. Burwell and C. D. Strang. *Journal of Applied Physics,* v. 20, Jan. 1949, p. 79-89.

In investigations of lubricated sliding friction between two crossed cylinders it is found that for hard, smooth surfaces, friction force is a straight-line function of applied load. The slope of this line defines a friction coefficient, designated as the incremental friction, which is thought to have certain advantages in the study of nonfluid lubricated friction. 21 ref.

25A-30. Scientific Research in Australia. *Engineering,* v. 166, Dec. 17, 1948, p. 592-593; Dec. 24, 1948, p. 617-618; Dec. 31, 1948, p. 640-641. Based on 21st Annual Report of the Council for Scientific and Industrial Research, L. F. Johnston Commonwealth Government Printer, Canberra, Australia. 6s.

Summary of research activities in diverse fields for the year ending June 30, 1947.

25A-31. Temperature Dependence of Friction in the Case of Steel as Compared With Metals Having Low Melting Points. (In Russian.) A. D. Isinskii. *Zhurnal Technicheskoi Fiziki* (Journal of Technical Physics), v. 18, Sept. 1948, p. 1189-1193.

The above was investigated for steel vs. paraffin or Wood's alloy. In the case of a great difference in the melting points of the two materials involved, the coefficient of friction decreases considerably with increased temperature.

25A-32. Naval Construction Research Establishment. D. E. J. Offord. *Welder,* new ser., v. 17, Oct.-Dec. 1948, p. 76-78.

Facilities of British laboratory.

25A-33. Underground in a "Hot Lab". *Automotive Industries,* v. 100, Feb. 1, 1949, p. 25-28.

Picture story shows equipment and procedures being used by Ford Motor Co. in its research program on practical applications of atomic science to production problems. Possible uses of radioisotopes, in material processing, radiography, and instrumentation.

25A-34. Electrical Developments in Metal Working for 1948. *Steel Processing,* v. 35, Jan. 1949, p. 24-26.

Equipment for welding, rolling, heating, machining, pickling, and cleaning.

25A-35. Metals in Review. *Engineering and Mining Journal,* v. 150, Feb. 1949, p. 70-95.

Annual survey presents statistics and discusses economic trends in the following separate articles: "Gold," M. A. Kriz; "Silver," Dickson H. Leavens; "Copper," H. H. Wanders; "Lead," Robert Lindley Ziegfeld; "Zinc," Charles R. Ince; "Tin," Erwin Vogelsand; "Light Metals," Richard J. Lund; "Minor Metals," Charles White Merrill; "Beryllium," Samuel A. Gustavson; "Arsenic," Samuel A. Gustavson; "Bismuth," Samuel A. Gustavson; "Mercury," Helena M. Meyer; "Antimony," Samuel A. Gustavson; "Cobalt," Hubert W. Davis; "Platinum-Group Metals," Hubert W. Davis; "Cadmium," Richard H. Mote; "Titanium," Helena M. Meyer; "Ferro-Alloy Metals," Charles White Merrill; "Manganese," Norwood B. Melcher; "Chromite," Norwood B. Melcher; "Nickel," Hubert W. Davis; "Molybdenum," Hubert W. Davis; "Tungsten," Hubert W. Davis; and "Non-Metallics," D. G. Runner. Tables and charts show variations in basic metal prices since 1897.

25A-36. Bearing Wear Caused by Electric Current. Donald F. Wilcock. *Electrical Manufacturing,* v. 43, Feb. 1949, p. 108-111.

Laboratory tests show that wear due to passage of current occurs only when the moving parts are separated by an oil film of critical thickness. Wear rate is a function of current rather than voltage, and is independent of bearing material.

25A-37. (Book). **Engineering Metals and Their Alloys.** C. H. Samans. 913 pages. MacMillan Co., 60 Fifth Ave., New York 11, N. Y. $7.50.

Gives a general background of metallurgy and provides a classification of the engineering metals from an application rather than an alloy viewpoint. Production of metals, the theory of alloys, principles of heat treatment, shaping and forming of metallic materials, corrosion, alloys resistant to wear and abrasion, alloys of high strength and toughness, tool materials, bearing alloys, and other subjects.

25B—Ferrous

25B-1. Carpenter Builds New Lab to Speed Up Development of New and Better Steels. *Iron Age,* v. 162, Dec. 16, 1948, p. 141.

Illustrates building and facilities.

25B-2. Practical Metallurgy for the Steel Mill Engineer. W. B. McFerrin. *Iron and Steel Engineer,* v. 25, Dec. 1948, p. 61-71; discussion, p. 71-74.

Several methods of processing which have been developed during the past 5 to 20 years and are being applied to parts subject to fatigue, wear, and stress corrosion. Properties and applications of different types of alloy steels and cast irons. 11 ref.

25B-3. The Steel Shortage—How Long? Vance Bell and John S. Morgan. *Steel,* v. 124, Jan. 3, 1949, p. 143-145.

Future prospects.

25B-4. World Steel. S. D. Smoke. *Iron Age,* v. 163, Jan. 6, 1949, p. 190-197.

Statistics and information on the iron and steel industry throughout the world.

25B-5. Western Steel. R. T. Reinhardt. *Iron Age,* v. 163, Jan. 6, 1949, p. 258-265.

Despite a 300% increase in steel-making capacity over the past 9 years, the West Coast remains a steel-short area. The balance sheet of this fast growing section is studied.

25B-6. Developments in the Iron and Steel Industry During 1948. I. E. Madsen. *Iron and Steel Engineer,* v, 26, Jan. 1949, p. 94-117.

25B-7. A Brief History of Alloy Steel. Carl A. Zapffe. *American Society for Metals,* 1948, 27 pages. Reprinted from *Metal Progress,* v. 54, Oct. 1948, p. 459-467.

A review of the development of the industrial and engineering aspects.

25B-8. Planning a Steel Mill Lubrication Program. W. M. Schuck. *Lubrication Engineering,* v. 5, Feb. 1949, p. 10-14.

25B-9. Flow Chart of Raw Materials & Finished Products in 1948. J. C. Sullivan. *Steel,* v. 124, Feb. 7, 1949, p. 100.

Unique chart shows tonnages at each step from coal, ore, limestone, gas, electric power, water, etc.; through intermediate products like pig iron, coke, semifinished steel, to finished products, which are tabulated under type of product and type of industry receiving direct mill shipments.

25B-10. Plan for East Coast Steel Plant. Harold A. Knight. *Journal of Metals,* v. 1, sec. 1, Feb. 1949, p. 6-9.

Economic possibilities.

25B-11. Mining Gear Failures From a Metallurgical Aspect. R. Jeffrey. *Colliery Guardian,* v. 178. Jan. 20, 1949, p. 69-74; Jan. 27, 1949, p. 129-132.

In 1932 the Safety in Mines Research Board began to examine mining equipment found to be defective or which had failed in service. Results of examinations and of research.

25B-12. Sonderstahlguss fur hohe Festigkeitsbeanspruchungen. (Special High-Strength Cast Steels.) Karl Roesch. *Die Neue Giesserei,* v. 33-35 (new ser., v. 1), Aug. 1948, p. 39-41.

Chromium alloy steels, their compositions, methods of melting and casting, cooling, heat treating, and physical properties.

25C—Nonferrous

25C-1. Surface-Active Agents; Applications in Non-Ferrous Metals Technology. J. Koerner. *Metal Industry,* v. 73, Dec. 3, 1948, p. 452-453.

See abstract of "Surface Agents As Applied in Non-Ferrous Metal Technology", publication of National Lead Co. Research Laboratories, Brooklyn, N. Y., item 26c-8, 1948.

25C-2. The Lithium Industry. R. B. Ellestad. *Canadian Mining and Metallurgical Bulletin,* v. 41 (*Transactions,* v. 51), Nov. 1948, p. 619-622.

Chemistry; occurrence; extraction; and uses in electrochemistry, air conditioning, metallurgy, organic chemistry, ceramics. 17 ref.

25C-3. Stockpiling Aggravates Nonferrous Shortages. F. R. Briggs. *Steel,* v. 124, Jan. 3, 1949, p. 146-147.

Present status and future prospects.

25C-4. Nonferrous Metals. John Anthony. *Iron Age,* v. 163, Jan. 6, 1949, p. 266-273.

Present economic status and future prospects.

25C-5. Titanium. Bruce W. Gonser. *Journal of Metals,* v. 1, sec. 1, Jan. 1949, p. 6-9.

Occurrence and ores, process metallurgy, physical metallurgy, properties, applications, and present status and future prospects for commercial development.

25C-6. Copper and Copper Alloys; Technical Progress in 1948. E. Voce. *Metallurgia,* v. 39, Dec. 1948, p. 75-80. 47 ref. (To be continued.)

You need not be...

A BALLET DANCER TO BE ON YOUR TOES

BUT YOU HAVE TO BE ON YOUR TOES TO SUCCEED.

Are you keeping up with the steady march of developments in the metal industry? Are you aware of all the new materials, products, and processes that are constantly being developed? Try yourself out on the questions below. They are all based on current metallurgical developments mentioned in this issue of *Metals Review*. Check the correct answers, indicate where the answer to each question is found, and mail to *Metals Review*. The names of all who submit a complete set of correct answers before April 15 will be published in the May issue.

GET *YOUR* NAME ON *METALS REVIEW'S* HONOR ROLL OF THE WELL INFORMED

1. How does "cool grinding" reduce generation of heat?
   (a) The part is submerged in a bath of coolant during the grinding operation.
   (b) A newly developed composition of sulphurized mineral oil is used.
   (c) Coolant flows through the pores of the grinding wheel.
   Answer found on page ——, item No. ——.

2. What is the reason for the good cold working characteristics of magnesium-lithium base alloys?
   (a) Lithium lowers the ratio of compressive to tensile yield strength.
   (b) It raises the density of the alloys to 1.9 g. per cc.
   (c) It changes the crystal structure of the magnesium from hexagonal to body-centered cubic.
   Answer found on page ——, item No. ——.

3. What combination of operations is performed in a new one-step process for tools and dies?
   (a) Machining and polishing
   (b) Casting and annealing
   (c) Grinding and hardening
   (d) Hardening and brazing
   Answer found on page ——, item No. ——.

4. What alloying element is being used in the commercial development of ductile cast iron in this country?
   (a) Cerium
   (b) Lithium
   (c) Magnesium
   (d) Silicon
   Answer found on page ——.

5. What technique used in the silverware industry has good possibilities for the manufacture of turbine blades?
   (a) Induction heated silver brazing
   (b) Differential rolling with eccentric rolls
   (c) Reverse deep drawing using bronze dies and water-soluble lubricants.
   Answer found on page ——.

6. What alloying element is used in two new extruded magnesium alloys developed for aircraft use?
   (a) Chromium
   (b) Manganese
   (c) Copper
   (d) Silicon
   Answer found on page ——.

7. What is the principal advantage of a new, portable, inert-gas-shielded spot welding torch?
   (a) Use of an inexpensive new-type inert gas
   (b) Elimination of water cooling
   (c) Welding from one side of the work without backing
   Answer found on page ——.

8. What technical societies will present papers at the Western Metal Congress in Los Angeles next month?
   (a) ASM, AWS, ASME, AFS, AIME
   (b) ASM, SNDT, AIME, AWS, ASTM
   (c) ASM, AWS, AIME, AFS, SNDT
   (d) ASM, AWS, AIME, ASTM, NACE
   Answer found on page ——.

NAME .... TITLE ....

COMPANY .... ASM CHAPTER ....

MAIL TO METALS REVIEW, 7301 EUCLID AVE., CLEVELAND 3, OHIO

NEW PRODUCTS *in Review*

778. Rotary Furnace

Perfect timing and uniform heating are two important factors governing low-cost, efficient production at the American Fork & Hoe Co.'s plant in Ashtabula, Ohio. Here hundreds of forks in various sizes roll from the production line each day.

The Gas Machinery Co. has designed and installed at this plant a special oil-fired rotary hammer welding furnace. This furnace carries a thermal head upwards of 2900° F. to heat work to 2300° F. at high speed. Fast, localized heating is a must in the split-second heating process necessary in this continuous operation.

Gas Machinery rotary furnaces are built in various types and engineered for specific applications of forging, tempering and clean heat treating.

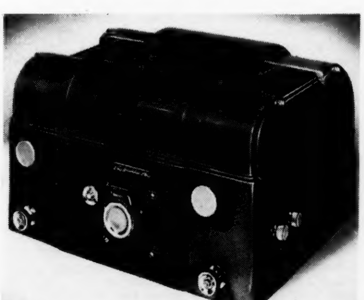
For further information write Matthew Snodgrass, Gas Machinery Co., 16100 Waterloo Rd., Cleveland 10, or use coupon on page 53, circling No. 778.

779. Wet Surfacer

Offered to the metallographer is a new 1251 AB duo-belt wet surfacer for specimen preparation. It follows the grinding sequence from very coarse to very fine.

The special belts may be used wet or dry, and are available in grits from 80 to 600. A ½-hp. motor with two speeds drives both belts at either 1600 or 3200 ft. per min. The belts are 4 x 36 in., and the flat grinding area is 4 x 6½ in. The grinding area is open at both ends so that specimens may extend over the edges of the belt.

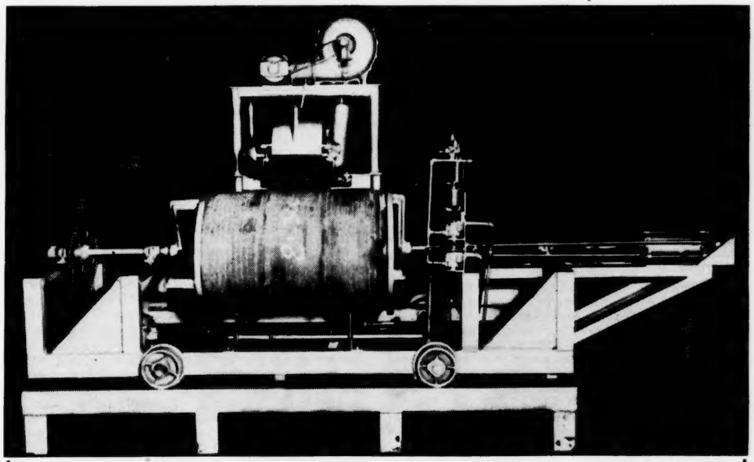
Header jets distribute the coolant uniformly over the entire work area. The machine is designed for bench mounting, an external water and waste connections may be used. Other coolants such as water soluble oil are preferable, however, and can be readily supplied by connecting a 1216 AB recirculating cooling system to the surfacer.



With the exception of belt speed, all controls for the two belts are independent; these include belt tension and belt centering controls and coolant control.

For further information write Adolph I. Buehler, Buehler Ltd., 165 West Wacker Dr., Chicago 1, or use coupon on page 53, circling No. 779.

780. Drum Cleaning Machine



This machine for cleaning steel drums was built in the shop of the Columbus Barrel Cooperage Co., in spare time, to supplant the use of a portable brushing tool. The new method cuts the cleaning time 80% per drum. An Osborn Mfg. Co. field engineer suggested the machine and the shop workers did the rest. The drum is held rigid between two circular end pieces by means of compressed air pressure. A chain drive, powered by an electric motor, revolves the drum. The upper framework is moved manually as each section of the drum is cleaned. A motor-driven suction fan at top absorbs the dust and dirt. For further information write J. G. Gammel, Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, or use coupon on page 53, circling No. 780

781. Hard Facing Alloys

A complete new line of hard facing alloys bearing the Airco trademark is divided into three primary groups—ferrous alloys, cobalt-base alloys and tungsten carbide. The groups contain a total of 15 hard facing alloys, especially developed to combat abrasion, impact, heat and corrosion, and to increase the work-life of equipment many times.

To stimulate the introduction of this latest member of the Airco welding family, the manufacturer is offering a trial assortment at a special price of $2.95. The assortment consists of the new Aircolite hard facing alloy, especially recommended for equipment subjected to severe abrasion and medium impact such as pulverizer hammers and core crusher rolls (for oxy-acetylene and electric arc application), and the new Airco self-hardening alloy for equipment subjected to severe impact and abrasion such as bucket teeth and sizing screens (electric arc).

To receive a trial assortment, send check for $2.95 to Air Reduction Sales Co., 60 East 42nd St., New York 17, or to the nearest Airco sales office. For further information write G. T. Van Alstyne at the New York office, or use coupon on page 53, circling No. 781.

EMPLOYMENT SERVICE BUREAU

The Employment Service Bureau is operated as a service to members of the American Society for Metals and no charge is made for advertising insertions. The "Positions Wanted" column, however, is restricted to members in good standing of the A.S.M. Ads are limited to 50 words and only one insertion of any one ad. Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, O., unless otherwise stated.

POSITIONS OPEN

East

RECENT METALLURGICAL GRADUATE: For process development in precious metals and stainless steel. Good opportunity in small but long-established plant in Philadelphia area. Give full information in first letter including minimum starting salary. Box 3-5.

SALES ENGINEER: Philadelphia. For manufacturer's agent representing ferrous and nonferrous metal manufacturers along with chemicals and machinery builders. Candidate can be young or middle aged, with or without experience. Compensation will be commensurate with ability. Submit detailed résumé and salary expected. Real opportunity for right man. Box 3-140.

ASSISTANT TO SALES MANAGER: For leading welding rod and electrode manufacturer. Industrial sales experience, knowledge and experience of welding equipment required. Must be a good combination field and office man capable of organizing the department and its various activities. At least five years of field sales experience, and a B.A. degree or equal. Free to travel; age 28 to 40. Salary commensurate with experience and capabilities. Submit complete resume. Box 3-145.

SPECIAL REPRESENTATIVE: A new position created by well-known manufacturer of electrodes and gas welding rods. Object to visit railroads, so as to improve relationships and sales. Requirements: welding experience, knowledge of welding problems peculiar to railroads, good contacts with railroad management, college education, excellent sales personality, good sales record in metal field, free to travel, age minimum 35. Box 3-150.

Midwest

GRADUATE METALLURGICAL ENGINEER: To do laboratory research work improving product and processes in metalworking plant. Sound background in mechanics desirable. Should have several years' industrial experience. Box 3-10.

METALLURGIST: Three to ten years' experience in ferrous metallurgy—steel heat treatment, metallography, material and process standards, metallurgical inspection, foundry metallurgy. Box 3-15.

West Coast

RESEARCH METALLURGIST: For research on materials and fabrication of chemical process equipment. Prefers Ph.D. in physical metallurgy with several years' experience. Box 3-20.

Positions Wanted

METALLURGICAL ENGINEER: Age 27, married. B.S. in metallurgical engineering. Six years' diversified experience in metallurgical contact work, heat treatment, failures investigation, report writing, research and development of ferrous materials. Desires position with small enterprising organization in East or Midwest. Box 3-25.

METALLURGIST - MATERIALS ENGINEER: Age 26, single. B.S. and completing work for master's degree in metallurgical and industrial engineering. Three years of diversified experience includes teaching, research, development, and engineering in nonferrous physical metallurgy. Desires position in production control or development. Metropolitan New York area preferred. Available immediately. Résumé of experience on request. Box 3-30.

MANUFACTURING EXECUTIVE: M.E. and M.S. Experienced in product design, production methods, and modern manufacturing management. Unusual combination of high technical ability and general knowledge of business and human relations. Seeks a position as assistant works manager—or similar position—where real leadership and ability may be used. Available soon. Will locate anywhere. Age 38, married. Box 3-35.

PRECISION CASTING: Young metallurgist with thorough knowledge of precision investment casting from sales to production management to casting, wishes to be relocated. Has made enviable record with present employers who do not wish him to leave. Desires responsible position in precision casting or technical position with sales or engineering in reliable concern. Box 3-40.

METALLURGIST: Experienced in laboratory techniques, service failure analysis; designing and constructing heat treating and forge furnaces; designing and building heat treat jigs and fixtures and special flame heating machines; heat treatment of plain carbon, alloy, die and high speed steels; supervision and hard work. Age 31, Married. B.S. degree. Box 3-45.

HEAT TREATER: Age 36, married, two children. High school education and supplementary courses. Nine years' experience in toolroom and production heat treating for munitions manufacture. Box 3-50.

ENGINEER-LAWYER: B.S. in mechanical engineering (Tau Beta Pi and Pi Tau Sigma); recent graduate of Harvard Law School. Three and one-half years of practical engineering experience in civil, mechanical and marine engineering. Desires a position in law or executive engineering. Location immaterial. Box 3-55.

METALLURGICAL ENGINEER: B.S. and year of graduate research.* Age 26, married. Three years' experience production heat treating, electroplating, and quality control. Thorough knowledge of co-ordination of heat treatment and machining operations. Qualified in furnace maintenance and instrumentation; physical testing and metallographic laboratory work included. Two years' experience in electronics. Box 3-60.

TECHNICAL WRITING: Or editorial position wanted by a metallurgical engineer with 20 years' varied experience in nonferrous and ferrous metallurgy. Author of a handbook and contributor to trade magazines. New York area preferred. Box 3-65.

METALLURGICAL ENGINEERING GRADUATE: Age 34. Research and development experience in high-temperature alloys, high speed, tool, stainless steels, and cast irons. Investigation of failures in ferrous alloys. Specialty—metallographic technique. Experience in powder metallurgy. Desires to relocate in West Coast with progressive organization. Box 3-70.

METALLURGIST: Light metals. Twenty years' experience in melting, casting, rolling and extrusion of aluminum and magnesium. Familiar with production problems, alloy development, laboratory control and sales engineering. Excellent background and knowledge of entire industry. Box 3-75.

METALLURGIST: With experience in metallography, heat treatment, radiography, chemical analysis, physical testing, failure analysis, and with supervisory capabilities, desires position as head of small laboratory or work of an investigative nature such as material failure analyses on aircraft or automotive engine parts. Box 3-80.

GERMAN METALLURGIST: Experienced in light metal alloys and their production into semi-finished products. Has held positions of responsibility and independence in research, failure investigations, inspection and training apprentices of testing. Doctor's degree. Box 3-85.

METALLURGIST: Age 23, single, veteran, B.S. in metallurgical engineering from noted Midwest engineering college, 1948. Nine months' experience in production laboratory with high speed steels and general metallurgy. Desires position in research and development or production work with opportunity for training and advancement. Prefers Midwest, but other areas considered. Box 3-90.

METALLURGICAL ENGINEER: B.S. in metallurgical engineering. Age 26, married. Six years' experience including 2½ years ferrous welding research, 1 year magnesium and aluminum production and sales, 2½ years college teaching of engineering. Desires research or teaching position in East. Available June. Box 3-95.

METALLURGIST: Age 32, married, family. B.S. in metallurgy from Case Institute of Technology. Nine years' diversified experience in ferrous foundries plus steel mill and toolsteel experience. Especially well qualified for responsible position in the foundry industry. Best of references. Active in service organizations and community affairs. Box 3-100.

METALLURGICAL ENGINEER: Ph.D. Twenty-three years' engineering experience in steel and metal fabricating industries, including 12 years of supervision of research projects, development of cold forming and surface treating processes, heat treatment, quality control and testing of ferrous and nonferrous metals. Currently engaged in the educational field. Desires responsible position as research, development, process control or consulting metallurgist. Box 3-105.

METALLURGICAL ENGINEER: B.S. University of Washington, 1936. Thirteen years' diversified experience in oil and chemical industry as metallurgical and chemical engineer. Plant problems, materials selection, new chemical process plants, metallurgical research laboratory direction. Desires responsible position as metallurgical engineer. Prefers West Coast, but will consider other locations. Age 34, married. Box 3-110.

PLANT MANAGER: Top-bracket coordination engineer desires management of unionized fabricating plant open to vigorous and progressive initiative. Seasoned to dispositions of men and machines. Metallurgical background in behavior of metals under forging, stamping, machining and welding process. Box 3-115.

METALLURGICAL ENGINEER: Considerable advanced training in metallurgical engineering and allied subjects. Graduate of several universities. Young, married. Several years' experience in the mineral industries, research and teaching. Desires position in the educational field. Inquiries promptly answered. Box 3-120.

HEAT TREAT FOREMAN: Twenty-nine years' diversified experience in heat treating. Twenty-three years as supervisor and instructor. Willing to do tool hardening and supervise production or materials selection. Extensive experience on various high speed, oil hardening, carbon and alloy steels, with older and modern types of equipment, and in all phases of tool and production work. Married, age 49. South of New Jersey preferred. References. Available now. Box 3-125.

METALLURGICAL ENGINEER: Graduating in June 1949, with B.S. in metallurgical engineering, from Rensselaer Polytechnic Institute. Age 26, married, one child. Experience as machinist, research assistant and foundry laborer. Desires production or sales position, preferably in metal casting field. Box 3-130.

METALLURGICAL ENGINEER: B.S., married. Seven years' practical experience with joining methods, including resistance welding, fusion welding and brazing methods for ferrous and nonferrous materials. Several years' experience in the manufacture of seamless and welded tubing. Prefers the Midwest. Box 3-135.

CHAPTER MEETING CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Akron	Apr. 13	University Club	J. Y. Riedel	Trouble Shooting; Toolsteels
Baltimore	Apr. 18	Engineers Club	N. H. Mochel	Metallurgical Considerations of Gas Turbines
Birmingham	Apr. 5	Hooper's Cafe	T. W. Lippert	
Boston	Apr. 1	Hotel Sheraton	C. S. Smith	Microstructure of Metals
Buffalo	Apr. 14	Univ. of Buffalo, Engineering Bldg.	Dr. Mohn	
Calumet	Apr. 12	Phil Smidt & Son, Whiting, Ind.	Ed. Brown	Soaking Pit Practice
Chicago	Apr. 11	Furniture Club	Steve Osborn	Developments in the Metallurgy of Titanium and Zirconium
Cincinnati	Apr. 20	Dayton, Ohio		Tri-Chapter Meeting
Cleveland	Apr. 4	Cleveland Club	W. L. Fink	Physical Metallurgy of Aluminum Alloys
Columbus	Apr. 20	Dayton, Ohio		Tri-Chapter Meeting
Dayton	Apr. 20	Engineer's Club		The Metallurgy of the Joining of Metals (Tri-Chapter Meeting)
Detroit	Apr. 11	Horace H. Rackham Educational Memorial	Maxwell Gensamer	States of Stress in Steel
Eastern New York	Apr. 12	Circle Inn, Lathams, N. Y.	R. W. E. Leiter	Deep Drawing of Sheet and Strip Steel
Hartford	Apr. 12	Torrington, Conn.		Torrington Manufacturing Co. Plant Visitation
Lehigh Valley	Apr. 1	Hotel Traylor, Allentown, Pa.	R. L. Templin	The Determination and Significance of the Mechanical Properties of Metals
Los Angeles	Apr. 28	Rodger Young Audit.	H. K. Work	National Officers' Night
Louisville	Apr. 5		J. T. MacKenzie	Cast Irons
Mahoning Valley	Apr. 12	V. F. W. Hall, Youngstown	Peter Payson	Annealing of Steel
Milwaukee	Apr. 19	City Club	C. W. Kennedy	Quality Control
Montreal	Apr. 4	Queen's Hotel		Ladies Night
New Haven	Apr. 21	Burroughs Library Lecture Hall, Bridgeport	Morris Cohen	High Speed Steel
New Jersey	Apr. 18	Essex House, Newark	A. L. Field	Stainless Steels
New York	Apr. 11	Building Trades Employers Assoc.		Operation Backfire (Film)
Northwest Pa.	Apr. 21	Warren, Pa.	G. C. Kiefer	Corrosion Resisting Steels
North Texas	Apr. 6	Y.M.C.A., Dallas	E. E. Thum	Implications of Atomic Energy
North West	Apr. 21	Covered Wagon, Minneapolis	H. B. Knowlton	Specification and Selection
Notre Dame	Apr. 13	Engineering Audit. Univ. of Notre Dame		The Effect of Structure on Machining Steels
Ottawa Valley	Apr. 5	Bureau of Mines	Maurice H. Haycock	The Spectrograph in Industrial Metallurgy.
Ontario	Apr. 8	Royal York Hotel, Toronto	D. C. Sunnucks	Fabrication of Light Alloys
Penn State	Apr. 5	Mineral Industries Art Gallery	Chas W. Briggs	Steel Foundry Practice
Philadelphia	Apr. 29	Engineers Club	J. J. B. Rutherford	Alloys for High-Temperature Service
Pittsburgh	Apr. 14	Roosevelt Hotel	Reid Kenyon	Finishing Steel for Decorative and Protective Purposes
Purdue	Apr. 23	Purdue Memorial Union Bldg.		Machinability Symposium
Rhode Island	Apr. 6		R. E. Zimmerman	The Steel Industry
Rochester	Apr. 11	Univ. of Rochester	G. A. Roberts	High Speed Steels
Rockford	Apr. 27	Faust Hotel	G. A. Roberts	Tool Steels
Rocky Mountain	Apr. 15	Oxford Hotel, Denver	R. K. Kulp	Ferrous Alloys in Steelmaking
Pueblo Group	Apr. 14	Minnequa Club	R. K. Kulp	Ferrous Alloys in Steelmaking
Southern Tier	Apr. 29	IBMCC		Annual Joint Engineering Societies Meeting
Springfield	Apr. 18	Hotel Weldon	W. A. Klock and C. Carter	Modern Quality Control
St. Louis	Apr. 21	Alton, Ill.	G. A. Roberts	New Developments in Toolsteel
Syracuse	Apr. 5	Oneida Limited, Oneida, N. Y.		Plant Tour and Lecture
Terre Haute	Apr. 4	Student Union, Indiana State	Samuel L. Hoyt	Metallurgy of Welding
Tri-Cities	Apr. 5	Rock Island Arsenal Cafeteria	Corwin Swan	Sheet Steel Manufacture and Application
Tulsa	Apr. 12	Spartan Cafeteria	A. F. Leach	Electronic Heating for Induction Hardening and Brazing
Utah	Apr. 18	Salt Lake City	A. E. Focke	National Officers Night and Chapter Installation
Warren	Apr. 14	El Rio Cafe		
Washington	Apr. 11	Garden House Dodge Hotel	R. M. Parke	The Vacuum-Arc Casting of Molybdenum
West Michigan	Apr. 18	Lansing, Mich		Plant Visit to Oldsmobile Division, G. M. C.
Western Ontario	Apr. 8	Cobblestone Inn, London	Mr. Peterson	The Drawing of Metals
Wichita	Apr. 19	Knights of Columbus Hall	J. A. Harrington	Precision Inspection
Worcester	Apr. 13	Sanford Riley Hall, Worcester Tech	Carl G. Johnson	Powder Metallurgy
York	Apr. 13	Harrisburg, Pa.	S. L. Hoyt	Metallurgy of Welding

NEW PRODUCTS *in Review*

782. Electric Furnace

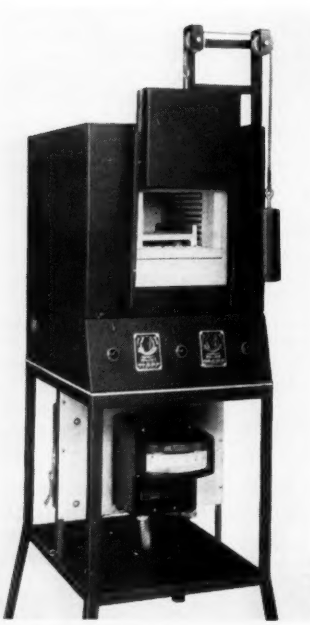
A new floor model electric furnace is designed to give the utmost in temperature control for tool and die work, hardening and drawing. Heat can be controlled over the entire range from room temperature up to and including 2000° F.

Temperature is controlled by two Huppert Infitrols. These stepless input controllers are mounted onto the base of the furnace, and another control is mounted beneath the furnace itself; all controllers are thus integral parts of the unit, with no external mountings to be provided by the customer.

The furnace has two sets of heating elements, one set in the top and bottom and the other in the two sides of the furnace. Each set is controlled by one of the Infitrols, with the temperature governed automatically by a Capacitrol. Temperatures as low as 100° F. can be held with the same accuracy as higher temperatures in ordinary furnaces.

For drawing purposes, requiring temperatures of 350° to 500° F., both sets of elements can be placed in low position on the Infitrols, with the Capacitrol providing absolute uniformity of temperature. For steel hardening, the furnace operates over the normal range of 1400° to 2000° F.

Standard operation is preferable on 220-volt, single phase, but 110-volt models are available at no extra cost.



For further information and prices write K. H. Huppert, K. H. Huppert Co., 6830 Cottage Grove Ave., Chicago 37, or use coupon on page 53, circling No. 782.

783. Spot Welding Torch

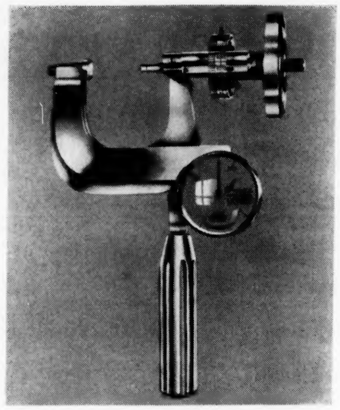
A new portable, inert-gas-shielded spot welding torch is called the Heliarc HW-8. Spot welds can be made from only one side of the work without the necessity of backing the weld location.

Mild steel, low alloy and stainless steel, 0.030 to 0.064 in. thick, can all be welded using currents from 155 to 250 amp. Not only can two sheets of these metals be joined in 1 to 2 sec. per spot, but also a sheet of metal can be joined to underlying material of any thickness. This makes it possible to clad corrosion resistant sheets to mild steel.

The torch is especially useful where the structure is large or of complicated shape because welding is done from one side and no forging pressure is required. Argon gas shields the electrode and weld area to prevent oxidation. Welding duration and argon flow are accurately controlled by a separate timer unit. This torch uses alternating or direct current with high frequency starting and stabilization of the arc.

The Heliarc HW-8 torch is lightweight, pistol-shaped, and trigger operated. Only one hose assembly connects the torch to the accessory equipment. The hose is about an inch in diameter and contains conductors for power cable, cooling water, shielding gas, and trigger control.

For further information write John McCracken, Linde Air Products Co., 30 East 42nd St., New York 17, or use coupon on page 53, circling No. 783.



784. Hardness Tester

The Ames Model 2 hardness tester is similar to the Model 1, but is designed to test larger dies, knives, cutters, saws, gears, round and flat stock, tubing, and odd-shaped parts up to 2 in. It will also test farther in from the edge of the sheet stock. Like the Model 1, it weighs only 2½ lb., is convenient, accurate and durable.

The Rockwell method is used, with pressure applied to the penetrators by screw action instead of with weights and levers. Tests are made directly in Rockwell hardness numbers, from which Brinell equivalents can be figured. As the large handwheel is turned to increase the pressure, the tester frame is forced open, and the lever on the front of the frame lifts, causing the indicator hand to move around the dial.

Complete equipment includes one diamond penetrator, one 1/16-in. ball penetrator, one short and one long flat anvil, one short and one long V-anvil, two hard steel test blocks, one brass test block, a wooden container, and Rockwell conversion chart. Reversible anvils and penetrators, special anvils and larger ball penetrators can also be supplied.

For further information write Ira R. Ames, Ames Precision Machine Works, Waltham 54, Mass., or use coupon on page 53, circling No. 784.

785. New Oilite Plant

A new Chrysler-Amplex plant at 65th and Harper Ave., Detroit, recently completed, provides greatly expanded manufacturing facilities. It contains the latest equipment for production of Oilite heavy-duty, oil cushion bearings, finished machine parts, filters, friction units, and bar stock. Production includes both ferrous and nonferrous metals and alloys.

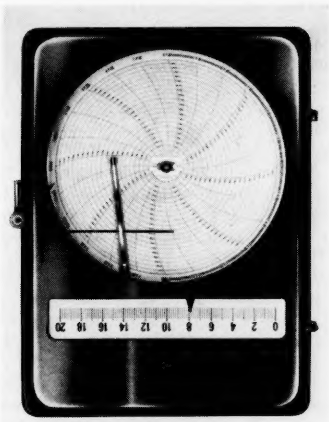
For further information write A. J. Langhammer, Amplex Division, Chrysler Corp., 6501 Harper St., Detroit, or use coupon on page 53, circling No. 785.

NEW PRODUCTS *in Review*

792. Time-in-Process Recorder

Development of a new instrument for recording time-in-process has been announced. The instrument gives a reading, on a uniform scale and chart, of rate of conveyer movement, directly in terms of the total time consumed by work in traveling through a process.

In many industries, specifications for processing products are stated in terms of total time through the process. If a conventional tachometer is used, the operator must convert revolutions per minute or feet per minute into total time, which is difficult since the time required for work to



pass through a process is a function, not only of rate of movement, but also length of the path.

With the new instrument, the readings of time-in-process are given directly with no calculations required. This simplifies the problem of establishing the correct conveyer speed for a given product.

Bristol time-in-process recorders are used on such equipment as continuous furnaces for metal annealing, tempering, and hardening, and continuous drying and baking ovens.

For further information write George Lonergan, Bristol Co., Waterbury 91, Conn., or use coupon on page 53, circling No. 792.

793. Fluxing Agent

Special Chemicals Corp. has recently been granted a third patent for its line of brazing and soldering fluxes marketed under the brand name Kwikflux. This latest patent covers Kwikflux #54, a fluxing agent with improved wetting and penetrating action for all types of hard soldering, brazing and welding.

Kwikflux meets all standards and specifications and is recommended for use on the following metals: iron, steel, stainless steel, copper, brass, gold, platinum, silver, monel metal, nickel, and nickel-silver. It works equally well with direct flame, gas, hydrogen, acetylene, muffle (direct and indirect) and induction heating.

For further information write Charles Doris, Special Chemicals Corp., 30 Irving Place, New York 3, or use coupon on page 53, circling No. 793.

794. Roto-Finish Machine

A new eight-door machine for finishing parts whose size and shape are not adapted to standard Roto-Finish processing methods is built as special equipment for individual requirements.

It is similar to the standard one-compartment Roto-Finish machine, except that each flat of the octagon cylinder is fitted with a large door. Parts are rigidly fixtured to the back of each door, so that surfaces to be finished are presented to the processing mass. Selective action caused by one-direction processing is overcome by reversing cylinder rotation.

All regular Roto-Finish processes and materials can be used with the eight-door machine and the same quality finishes can be expected as with the standard Roto-Finish equipment.

Extra cam locks are fitted to each door to overcome added strain imposed by fixtures on the doors. Doors and fixture plates are interchangeable to handle a multiple of different parts, all of which may be processed at one time. Doors may be either unlined or rubber-lined. Motor size varies with each application. Automatic timer controls are optional.

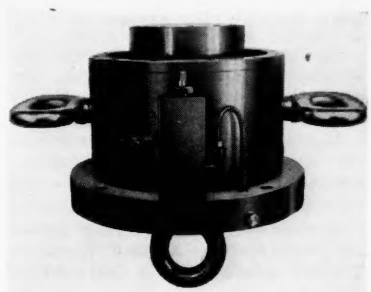
For detailed information write to D. T. Barrett, Sturgis Products Co., 203 Jacobs St., Sturgis, Mich., or use coupon on page 53, circling No. 794.

795. Weighing Cell

A new type of Emery hydraulic cell is designed for measuring tension loads as conveniently as compression. Capacities of three cells in compression are 20,000, 40,000 and 60,000 lb. Maximum tension loads of half these capacities may be applied on a removable eyebolt screwed into the inside end of the piston, which is made accessible through the closed end of the cell. The cells may be used in any position.

Load ranges may be as low as 0 to 1000, 0 to 2000 or 0 to 3000 lb. when using a Bourdon tube indicator, and as low as 0 to 200, 0 to 400 and 0 to 600 lb. when using a Tate-Emery indicator or recorder. Other commercial indicators and recorders may also be used. Sensitivity and accuracy depend almost entirely upon the characteristics of these mechanisms.

The Emery cell may be considered as a hydraulic cylinder with a frictionless piston having a stroke of less than 0.005 in. under full load. The fluid makes no contact with the piston but is sealed within the cylinder or cell as a layer about 0.03 in. thick held by a thin metal diaphragm against which the piston rests. Slight movement of the piston, produced



by any load, flexes the diaphragm and compresses the hydraulic fluid, thus transmitting pressure to the indicator. The piston moves without friction because it is centered by a bridge ring that maintains a well clearance of approximately 0.1 in. and prevents distortion of the diaphragm in the annular clearance space.

For further information write M. K. Wright, Baldwin Locomotive Works, Paschall Station, Philadelphia 42, Pa., or use coupon on page 53, circling No. 795.

796. Metallic Gallium

Gallium, a rare, silvery-white metal of unique properties, is now being produced and sold by Aluminum Co. of America in limited quantities. This unusual metal is liquid on a warm summer day (melting point, 86° F.), but it will not boil until heated to approximately 3700° F. Gallium shows a strong tendency to undercool, and the liquid metal may be held for some time at temperatures almost as low as the freezing point of water without solidifying.

Although similar to aluminum in its chemical behavior, gallium is not a light metal. Its density (5.9) is about twice that of aluminum, but only about half that of metallic mercury, which is also liquid at room temperatures.

Traces of gallium are found in a variety of ores and minerals, and chemists of Alcoa's Aluminum Research Laboratories have found a practical way of separating and concentrating the gallium oxide occurring in bauxite. From the oxide, metallic gallium of high purity is being produced.

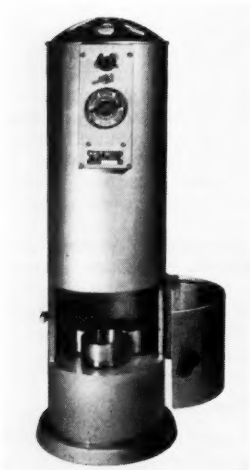
For further information write C. C. Conner, Aluminum Co. of America, 2162 Gulf Bldg., Pittsburgh 19, or use coupon on page 53, circling No. 793.

NEW PRODUCTS *in Review*

786. Lab Drying Oven

A "speed oven" which will cut laboratory drying time in half, has been placed on the market. It has a drying space 8 in. in diameter and 6 in. high. The over-all height of the unit is 29 in. Power requirements are 2800 watts at 115 or 230 volts.

A motor-driven fan forces filtered air past electric heating elements. The air temperature is thermostatically controlled at any chosen drying temperature between 150 and 350° F. The heated air flowing against and past the sample in the speed oven rapidly picks up the moisture or volatile material. A 3-in. diameter atmosphere exhaust connection is provided so that the heated air and any obnoxious fumes may be piped into a hood or duct.



The speed oven offers savings in the time of the laboratory staff and speeds up the reporting of analyses to the plant.

For further information write Jess Toth, Harry W. Dietert Co., 9330 Roselawn Ave., Detroit 4, or use coupon on page 53, circling No. 786.

787. Ductile Cast Iron

A new engineering material described as ductile cast iron, which combines the process advantages of gray cast iron (fluidity, castability and machinability) with the product advantages of cast steel, has been developed in the development and research division of the International Nickel Co. The material is characterized by a graphite structure in spheroid (or nodular) rather than flake form. Its excellent physical properties, particularly high elastic modulus, high yield strength and ductility, suggest its suitability for many applications hitherto considered beyond the scope of cast iron.

The spheroidal graphite structure is obtained by introducing into the iron a small but effective amount of magnesium or a magnesium-containing addition agent, such as a nickel-magnesium alloy. Common cast iron compositions melted in the cupola or in other kinds of furnaces can be used.

For pearlitic grades of cupola-melted material containing 3.2 to 3.6% carbon and 1.8 to 2.8% silicon, the ductile iron provides, in the as-cast condition, a combination of 85,000 to 105,000 psi. tensile strength with some ductility. In contrast to gray cast iron, strength is only moderately affected by section thickness. Under stress it behaves elastically like cast steel rather than cast iron, having proportionality of strain to stress up to high loads, with a modulus of elasticity of 25 million psi.

Potential applications for this new material are many and varied, particularly in the automotive, agricultural implement, railroad, and machinery industries. Heavy industrial equipment, such as rolls and rolling mill housings, could readily utilize its high strength and rigidity. Its ductility may provide thermal shock resistance far greater than has been available in high-carbon castings heretofore, and suggests that superior performance might be obtained in items such as railroad car wheels and ingot molds. The good resistance to growth and oxidation gives promise of its use in many engine, furnace and other parts operating at elevated temperatures.

A number of foundries have already arranged licenses for the manufacture of the new cast iron under International Nickel's pending patent applications.

For further information write R. A. Wheeler, International Nickel Co., Inc., 67 Wall St., New York 5, or use coupon on page 53, circling No. 787.

788. Induction Heater

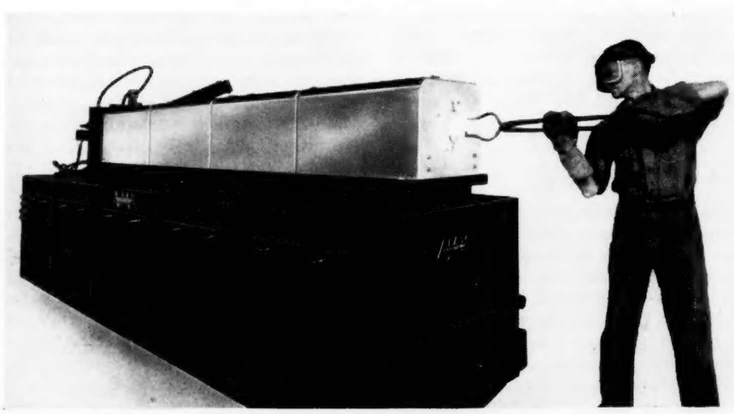
A new Ajax-Northrup induction heater delivers a 2½x3 15/16-in. steel blank every 4.8 sec. right to the mouth of the forging machine—every blank at a closely controlled temperature of 2200° F. Thus the operator can flip the billets into the dies at unusually high production rates without extra steps or conveyer systems.

Fast, scale-free heating reduces rejects and gives cleaner, more precise forgings. Freedom from scale reduces "down time" required to clean out dies, and also greatly lengthens die life.

Blanks are fed into a chute at the far end, from which they are automatically fed into the heating coil by a hydraulic pusher. As each cold billet is pushed into the far end, a hot billet is pushed out at the press end. Timing is fully automatic, and practically any production schedule can be accurately paced by the Ajax-Northrup heater.

The equipment can handle a wide variety of forging blanks. With simple adjustments it can be set to heat any length of slug up to the maximum stroke of the ram. The heaters shown will accommodate square or round billets up to 2½ in. diameter. The coils themselves are interchangeable, and constitute a relatively small part of the total cost of the equipment.

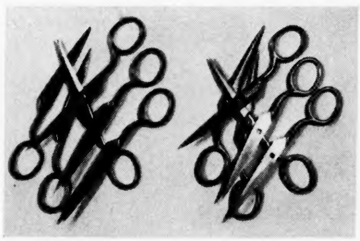
For further information write Robert N. Blakeslee, Ajax Electrothermic Corp., Ajax Park, Trenton 5, N. J., or use coupon on page 53, circling No. 788.



789. Stripper for Nickel

A material called "Enthone Metal Stripper" has been developed for chemically dissolving nickel and other metal coatings from steel without attacking the steel. The stripper is alkaline in nature, can be contained in a steel tank and requires no electric current. The parts to be stripped are merely immersed in a salt solution in the temperature range 160 to 180° F. Stripping speed varies from 0.0002 to over 0.001 in. per hr. depending upon the concentration of salts and the operating temperature.

The process is ideal for removing nickel plate from bulk work, such as barrel-plated steel. The Enthone process does not etch or attack the base



steel in any way. In most cases, the work needs merely be dipped in acid and can be replated.

The stripper is also effective for removing copper plate from steel as well as silver, cadmium and zinc. It is not suitable for removing nickel coatings from zinc-base die castings or copper alloys.

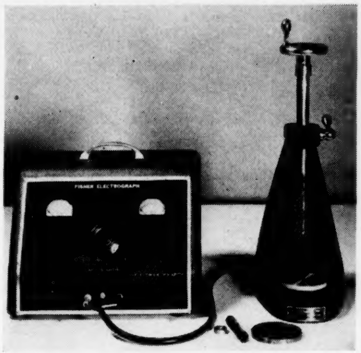
For further information write Walter R. Meyer, Enthone, Inc., Department MR, 442 Elm St., New Haven, Conn., or use coupon on page 53, circling No. 789.

790. Analysis Instrument

The new Fisher Electrograph is an instrument for qualitative and quantitative anaylsis of metals and alloys. It has the advantages that a negligible amount of sample is destroyed and that unmistakable spot color reactions are provided for identifying unknown constituents.

The instrument transfers electrically a few micrograms of the sample onto previously prepared bibulous paper or a gelatin surface. Standard qualitative spot tests then indicate the presence of the various elements.

The instrument includes a separate power source with batteries, electrode potential and polarity controls, and current-voltage meters. Current from this source is delivered by leads provided to the press stand where the sample is held under controlled pressure against the test paper. As the metal is transferred, the sample is the anode. An inert aluminum cathode support holds the test paper, which carries an electrolyte selected for the particular determination



being made. Current is applied usually for 20 to 30 sec., during which time a varying quantity of metal travels through the electrolyte and is deposited on the paper.

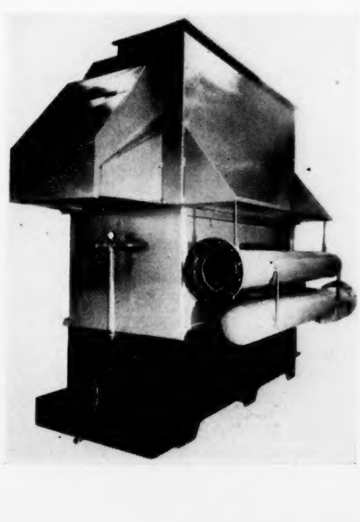
The color intensity of the reaction on test paper varies both with time of "exposure" and with concentration of the element in the sample. Thus, employing samples of known concentration to plot a curve, and following uniform procedure, quantitative measurements can be made.

Uses investigated include detection of pinholes in electroplated metals, detection of lead-containing brass, and observation of homogeneity. A valuable feature of the test is that the exact pattern of molecular composition in the sample is "pictured" on the test paper—thus indicating distribution of an element as well as its quantitative amount.

For further information write Robert Jones, Fisher Scientific Co., 717 Forbes St., Pittsburgh 19, or use coupon on page 53, circling No. 790.

791. Aftercooler

The new model of the Niagara Aero aftercooler is simplified in construction and protected from freezing in outdoor installation. This equipment dehydrates compressed air or gas by cooling it to a temperature



below the dry bulb temperature of the atmospheric air, thereby removing the moisture that condenses at that point and preventing further condensation of water in air or gas lines in use. This is done by evaporating a recirculating water spray on the surface of a coil through which the compressed air passes, creating a temperature close to the wet bulb temperature of the surrounding atmosphere and lower than the dry bulb temperature and also below the summer surface water temperature.

In the new model, protection against freezing is given by the "balanced-wet-bulb" control. A thermostat in the spray water reservoir is set for a desired low temperature limit at which it operates dampers to recirculate the air stream internally around a division plate in the center of the unit, instead of drawing in freezing air. This permits outdoor installations, to save space and give the benefit of the lowest wet bulb temperature in summer.

The Aero aftercooler consumes less than 5% of the cooling water required by conventional coolers. No cooling tower is required. Prevention of condensation in air lines saves water damage to air tools, paint sprays or materials in process.

For further information write Edmund J. Felt, Niagara Blower Co., 405 Lexington Ave., New York 17, or use coupon on page 53, circling No. 791.

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